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MOTOR AGE

Volume XXXIX
Number 20

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CHICAGO, MAY 19, 1921

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E. E. HAIGHT, Manager
DAVID BEECROFT, Directing Editor
RAY W. SHERMAN, Executive Editor B. M. IKERT, Editor

BRANCH OFFICES

DETROIT, 317 Fort St., W., Phone Maine 1351; CLEVELAND, 536-540 Guardian Bldg., Main 6432; NEW YORK CITY, U. P. C. Bldg., 239 W. 39th St., Phone Bryant 8760; PHILADELPHIA, Widener Bldg., Phone Locust 5189; BOSTON, 185 Devonshire St. Phone 4336 Ft. Hill.

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MOTOR AGE

Are You Armored Against Danger and Accident?

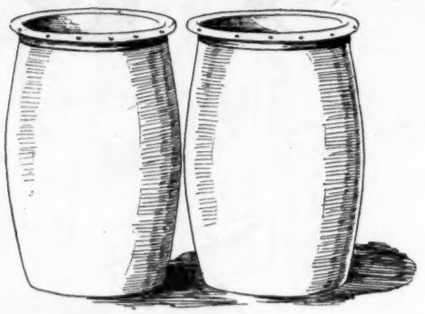
PROFITS from the dealer's service station may go for naught unless the dealer has taken the necessary steps to guard against unforeseen dangers and accidents. Sometimes the dangers are self evident and when that is the case there is little excuse for not guarding against them. On the other hand there are times when accidents occur, often very costly, which are the result of existing conditions of which the dealer is not aware.

Wherever there is much movement of power driven vehicles over a comparatively small area like the interior of the average service station, or where there is rapidly revolving machinery, tool usage, etc., there is a chance for collision, injured workmen, or property damage. It probably is impossible for a service station to eliminate entirely the possibility of accidents creeping in, but every dealer should see to it that he has taken the necessary precautions that will make his establishment practically impervious to common dangers.

On the following pages we have taken up some of the more common sources of danger in the service station which if not checked in time often gnaw at the cash register until finally, some day, they make serious inroads on the dealer's profits.

Do Your Employees Work in Safety?

Much of the Profit May Go for Naught If You Have to Spend a Hundred Dollars Now and Then for an Injured Employee or Customer



One time a concern whose product necessitated the handling of steel barrels had many cases of accident wherein the men mashed their fingers. So they designed the above types of barrels . The swelled portion keeps the rims far enough apart to prevent pinching the fingers

By
B. M. Ikert

THERE is another route by which the automotive dealer can make a profit other than that by way of the cash register and that is by taking the necessary precautions to prevent accidents, with, perhaps, resultant loss of life or limb on the part of his employees or customers.

Many of the larger factories of the country have individuals connected with them in the capacity of "safety engineers." It becomes their duties to see to it that employees work with a maximum degree of safety and comfort. Naturally, in a large factory where there may be performed a great variety of hand and machine operations and with a varying degree of danger present, it becomes essential that the management take steps to reduce the chance for accidents to a minimum.

This preventing of accidents does not mean simply providing guards for exposed belting or a gate on an elevator shaft doorway, but such things as seeing to it that the employees have proper light for their work, good methods for dispensing drinking water, etc.

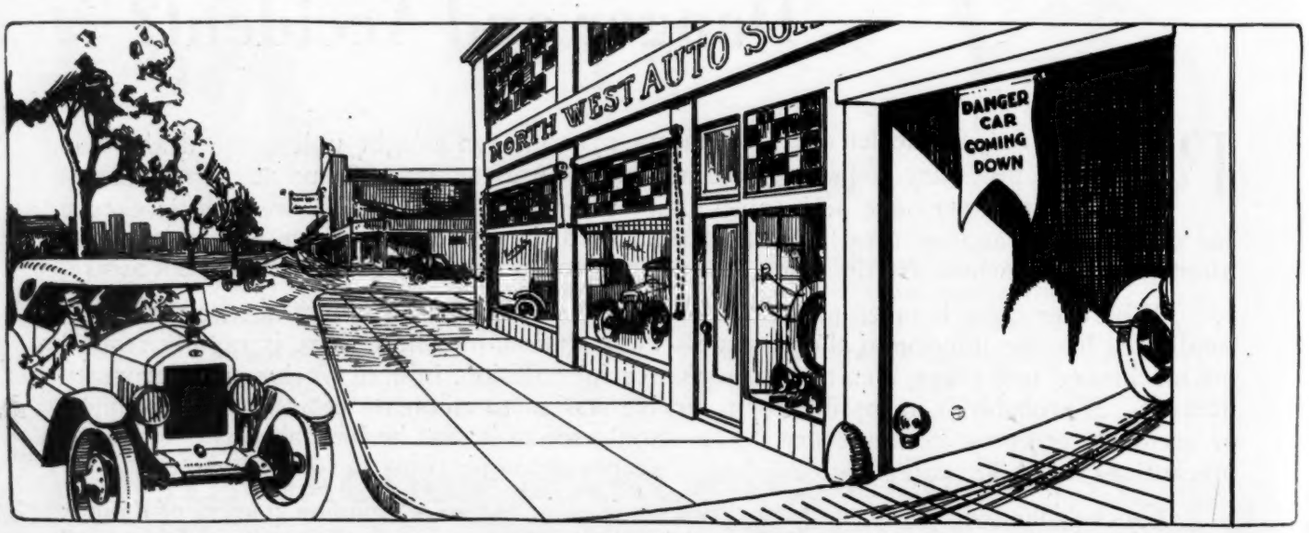
PROTRUDING SCREWS A MENACE

A few years ago it was common to have a great number of accidents in machine shops and factories due to exposed belts, protruding set screws on collars, etc. Often the workman would catch his sleeve into one of these rapidly revolving collars, resulting in a broken arm or even a more serious accident. Manufacturers of machine tool equipment soon saw the need for safety and there appeared on the market couplings, chucks, etc., fitted with set screws which were sunk into recesses so that it was impossible for anything to be caught by the set screws as they revolved.

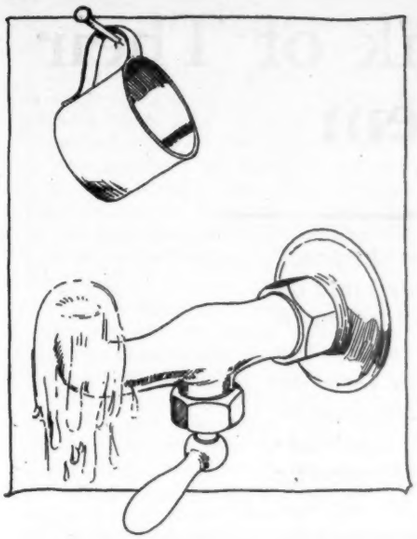
The same is true of unprotected belts. It is rarely the case now to find in a factory or shop that is handled on an efficient basis a belt traveling at high speed which is not properly guarded. Another example is that of grinding wheels. It is essential that these travel at a very high rotative speed and one which is apt to cause the wheel to break owing to the centrifugal force.

To overcome the danger or property damage resulting from a stone of this kind breaking it is common now to find grinders which have the wheel enclosed by a heavy metal housing, leaving only exposed enough of the stone on which to do the necessary grinding.

Every now and then a workman or mechanic gets hurt in the service station. Frequently this is due to falling. In many instances the workman himself is blamed for being careless, whereas in reality he is not at fault but the conditions under which he works. As an example, there may be mechanics working in your shop who work in a glaring



It is an excellent idea to protect your customers when they are in or about to enter your business. Above is shown a semaphore idea that might be applied to a building with a ramp. Some concerns have placed mirrors at strategic points in their driveways or ramps



Pure water will not cause infection, but the method of dispensing it it may. Why not give the spigot a half turn as shown above and make a sanitary drinking fountain. The cup can then be thrown away

light for a long time and when called to some other duty which perhaps takes them into a darker part of the service station they stumble or fall because their eyes have not adjusted themselves to the new condition.

NOT THE WORKER'S FAULT

Such a workman is not aware of any danger such as stumbling over a tool box, or something similar because what is obvious to the other workers is unseen by this particular man and the accident, therefore, is a result of poor conditions rather than carelessness on the part of the man. One of the quickest and surest ways of preventing accidents in the service stations, either to employees or customers, is to see that floors are kept clean of all such things as tools, boxes, hand trucks, etc.

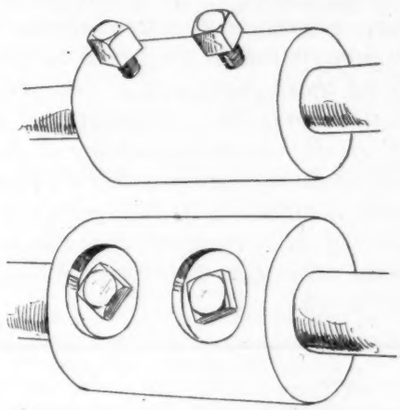
In some of the more efficient service stations it is common to see portable work benches and parts trays. The beauty of these devices is that tools and parts taken off a car all are kept together on this portable bench so that nothing is left to litter up the floor. It has another advantage in that the bench can readily be moved from place to place, and saves the workman many a step which naturally cuts down the chances for accidents because it keeps them confined more nearly to one locality.

THE FIRE DANGER

We recently visited a service station wherein work was being performed on several high priced cars on the quick service floor. It was in the afternoon and the day had been a busy one. Oil and grease had collected on the floor to quite an extent and without warning this material burst into flames, caused by the exhaust from one of the cars on which the engine was being tested.

Fire extinguishers immediately were brought into play but only after some damage had been done to the finish on one of the cars. In the long run it probably cost this service station more money to fix up the finish on the customer's car than it would have had a man been engaged to clean the floor once a day. There is always more or less danger present where gasoline and oil are used.

Every service station should take precautions when using a blow-torch or open flame of any kind around the car. Some of the older types of cars are fitted with mud pans which make excellent



In shops the old style of exposed set screw on a collar or coupling has been replaced by the safer type, which will not catch the sleeve of a workman as the shaft rapidly revolves

receptacles for catching oil and gasoline. Gasoline fumes, contrary to what is often supposed to be the case, do not rise but settle, consequently if a blow torch is set on the floor there is always a chance that some stray fumes might become ignited.

Then there is the item of protesting customers and others on driveways or ramps.

Many of the service stations of the country now do considerable battery work and one of the surest ways of increasing efficiency and protecting the men from acid burns, etc., is to provide them with acid proof aprons. The men are sure to appreciate this, knowing that splashing acids will not harm them or destroy their clothing.

POOR EYESIGHT CAUSES INEFFICIENCY

Frequently mechanics are blamed for poor work when apparently there seems to be no desire on their part for such work. One factory found out that certain men needed glasses and went to the trouble of sending the men to an oculist for examination. The result was that in a short time, when the men had been properly fitted with glasses, their work was much better executed and they felt better.

When a shop does considerable welding it is, of course, taken for granted that the man or men doing the work are properly fitted out with goggles for protecting their eyes. Here again it pays to take the matter up with some competent person to make sure that the goggles are the right kind and properly adjusted for the man.

In some of the smaller towns there often are poor facilities in the service stations for dispensing drinking water. The first essential, of course, is to know that the water is pure, but the usual source of infection is not generally the water but the method of dispensing. Even some of the common forms of inverted drinking fountains do not fill the bill because with many of them it is possible for the mouth to come in contact with them.

The old drinking cup hung on the nail

(*Concluded on page* 30)

One of the most prolific sources of accident in the service station is that of stumbling over articles left on the floor. A workman in a glaring light for some time is apt to stumble over a jack or something else left lying on the floor, because his eyes are not accustomed to the darkness

What Some Dealers Think of Their Fixed Price System

AN unusual amount of comment is rife among the trade concerning service operation on a flat rate basis and on a maximum estimate basis. The comment is not so much about the relative merits of the two plans, but about the great saving in money and in time that is effected through the use of either of these plans and of the great elimination of dissatisfaction among the customers of the establishment. MOTOR AGE has made inquiry of a few concerns using the flat rate and maximum estimate plans for service and in this respect the following statements from men who have used either of the systems contain many valuable pointers for those who are planning to institute similar plans for service work.

Satisfied After Four Years' Trial

WILLYS-OVERLAND, Inc., handling sales and service for Toledo, is thoroughly "sold" on the idea of the flat-rate for service charges and after four years of trial is making special "sales" of service to many customers.

"It's the finest system for us and the customer, too," declared L. G. Peed, manager. "The most of our time in the 'good old days' used to be spent in making adjustments and haggling with our customers as to what they ought to pay for service.

"Now a car is brought in, diagnosed, the price for the work is fixed, and the owner can come in and watch us do the work. He knows exactly what it will cost him before he gets it and usually he is a thousand-fold more pleased when the job is done."

There are a definite number of operations, for example, having to do with a fan. It happens that five operations cover this part of the car. The schedules contain these items under the head "description" and then opposite each movement is its number and the amount of time required to do the work. The prevailing rate for time is set up in a parallel column. The rate varies as economic conditions generally vary. Now it is $1.50 an hour, for example. If wages come down 16 per cent the rate will probably be made $1.25—merely to illustrate.

T. W. Skelding, manager of service department, has been with the flat-rate system from its inception and he believes that it is without fault when it comes to getting good work done, promoting satisfaction and setting a standard for employees.

"We first tried the system out on paint jobs," he said. "It appeared ridiculous for a man to come in with a car and ask us how much the job would cost and not be able to have the slightest idea of an answer to his question.

LOST ON FIRST JOBS

"So we figured what time and materials cost and began to make prices in advance for paint jobs. On the first 400 jobs we came out $44.13 in the hole.

"That illustrates a good point, too. The plan is not all sunshine at first. On some jobs money is lost and on others the loss is averaged up. The company is more apt to lose money when the trouble is not accurately diagnosed or when mechanics are not expert in handling the job. Therefore, it compels us to have only the best mechanics at work."

The charge for any operation depends upon the amount of time required and set forth in the schedule. There may be three grades of workmen according to their skill—those getting 60 cents an hour, those getting 70 cents and others making 85 cents an hour. Perhaps the average mechanic gets about 70 cents and the basic price of service is based upon an average.

GOOD MECHANICS SAVE MONEY

Experience shows that the 85-cent man will make the most money for the company, while the 60-cent man has the largest number of loss cards placed in his mail box.

At Willys-Overland, Inc., Toledo, it has been an incentive to men to make good records because when there is loss to the company on a job the men are notified and they know that results count most.

Employees are careful of time and materials because they know the company pays if there is waste.

The old plan has all the extravagance and waste features of the cost-plus system of wartime building.

The officials of the Willys-Overland, Inc., believe that there is grief ahead for the small service man who puts the system in on his own resources for the first few months of operation, but that it PAYS in the LONG PULL.

Bills Paid Promptly at Fixed Prices

C. H. WILLIAMS & SON, Bloomington, Ill., adopted the flat rate system for handling repair work a year ago. C. H. Williams finds that one notable advantage of the flat rate system is the certainty that the owner of the car, knowing to a penny what the job will cost, comes prepared to pay cash or write a check. He does not appear, as a rule, unless he has the money. When he does make his appearance, there is no haggling over the amount. The signature of the owner is always there, ready to confront him, should there be a dispute. Nothing additional is done to the car beyond that which is first authorized, unless the owner is called in, shown what is regarded as needed and approves the additional work and cost. This eliminates any chance for argument.

The C. H. Williams company has two records of the cost of each job. The ordinary car contains 2,000 possible jobs. The eight and twelve cylinder cars range from 3,000 to 4,000. The records maintained are on cards, one set being kept in the repair shop and the other in the office. The service man can refer to the files, whether in the shop or office, and thus save steps. When he made a list of the various items of work, he turns to the filing case, the cards being arranged alphabetically, starting with accelerator and ending with wheels, and in a few

minutes' time can compute the total cost of a job.

The estimate made by the service man is seldom in error. It is figured that perhaps three jobs out of a hundred are estimated either so that there is no profit to the company or there is an actual loss. The other 97 jobs show a reasonable profit, and some run a little head of the average profit, sufficient to counterbalance the loss or lack of profit from the three.

The files showing the cost of each possible job are corrected quarterly, the changes being based upon variation in the cost of materials and labor. The service tickets, turned in by the mechanics, give the accounting department a check upon the time of the employes. The manilla work ticket is retained by the bookkeeper for accounting, while the white service ticket goes to the records of the service man, being filed alphabetically and by months so that they can be referred to at any time.

This company finds many points of advantage to the flat rate system. In addition to those already enumerated, he cites the distrust that car owners are apt to experience if they enter a garage unexpectedly and see the mechanics engaged upon their car, dawdling or apparently wasting time and which the owner thinks he is paying for. Under the flat rate system, the car owner knows that no matter how much time may be wasted in the shop, the car owner is not paying for it.

The Only Way to Sell Service

SERVICE is the vital part of the foundation on which the motor vehicle dealer must build success, says Calvin C. Eib, of the Stuyvesant Motor Co., Hudson and Essex distributors for the Cleveland territory. It is vital to success, because a large number of sales will be turned to the dealer by superior service of the latter.

Service is a commodity; all commodities are sold for definite prices, and service on motor vehicles can and will eventually be sold on the flat rate or fixed charge plan. The dealers who come to this plan early are going to get the cream of the business. It's just another case of the early bird catching the worm. For 90 days the flat rate system for service has been in use in the Stuyvesant plant, a $1,500,000 institution that was completed a few months ago, and it has eliminated 90 per cent of the misunderstandings and complaints that the company formerly had with patrons of its service department.

The fixed charge plan is superior to the old method of hourly charge, and the dealer who uses it has an advantage over the fellow who is clinging to the old method, when both are working on the same prospect for a new car sale. Mr. Eib says that if he were general manager of a retail concern that was building an organization he would at the start divide his time equally to the service and sales departments, so that the development of both would be equal.

Every owner who drives a car into the Stuyvesant service department is not allowed to depart until he has with him a card, which describes the operation that is to be performed on the vehicle, and a description of all the work that is to be done, together with the charge. Blanket instructions from the owner, "here, put this car in shape," are not received. The schedule of charges are not yet set definitely as they may be revised at the end of the checking, which is difficult because comparisons have to be made with last year when conditions were far different than they are today. For this reason the schedule of prices is not published.

Favors Maximum Estimate Plan

"NOTHING could induce me to go back to the old plan of making repairs on automobiles," said A. Mason Gibbes, president of the South Carolina Automotive Trades Association and also president of the Gibbes Machinery Co., Columbia, S. C., which concern operates one of the most complete repairshops in the state.

"The 'maximum estimate' plan is the only plan that keeps us out of hot water with our customers. We do not employ what is commonly known as the 'flat rate' system of making estimates. We call our plan the 'maximum estimate' system and it consists of giving the customer a maximum estimate of the cost of the repairs to be made, and then if we find that our estimate was too high, we deduct from the charge in favor of the customer. If our estimate of the cost of repairs was too low, we bear the loss.

"This plan," continued Mr. Gibbes, "has transformed our repair department from a liability to an asset.

"Now we have a definite understanding at the start of a job. The customer knows what it is going to cost, and if he has kicks, he kicks before the job is begun. Nothing could induce us to go back to the old plan. I could give MOTOR AGE readers incident after incident in which this 'maximum estimate' plan has proven a real asset to us. It is the only system for the repairshop to follow. We have tried both plans and we simply would not take a job by the old system."

When a car comes to the Gibbes plant for repairs, experts go over it carefully. It is examined carefully; every little item is noted. Is a headlight cracked? A note is made of it. Is a fender bent or a button missing—down it goes in a book. No chance for the patron to come back with "That headlight was not broken when I left the car here." A report is made to the patron. Every new part that is to go into the machine is listed, the price of the part given and an estimate, clear and definite, is written on the repair order.

50-50 with Mechanic on Prices

THE L. E. Reed garage, Charles City, Iowa, has for the past two months been trying the flat-rate or fixed-price method of charging customers for work. They have not included all jobs of repair work in this method as yet but many repair jobs come under this system. They have found it works out satisfactorily to both customer and the company.

Mr. Reed considers that the new reconstruction year needs different methods than those that were in force in war times or last year and has, therefore, started new methods in his garage. A system that he has put in force in the past few weeks is in line with reduction of wages from the high peak wages of war times.

The idea now being tried out here is a 50-50 deal whereby the workman is paid one-half of the $1.25 per hour paid for the actual number of hours he is working on repair work on customers' cars. When not working on cars he lays off until business picks up.

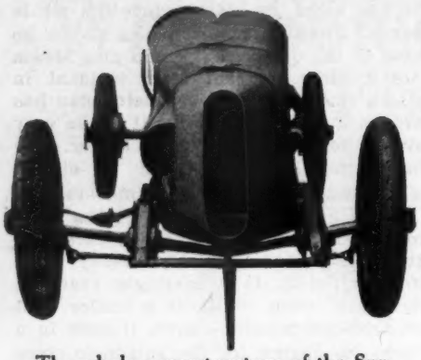
Itemize the Work in Detail for the Owner

Clean Carbon and Grind Valves

DESCRIPTION

1. *Remove cylinder head*
2. *Scrape carbon*
3. *Remove—reface and grind valves*
4. *Inspect and replace cylinder head gasket if necessary*
5. *Adjust all tappets to proper clearance*
6. *Clean and adjust distributer points and head*
7. *Clean and adjust spark plugs*
8. *Clean and adjust carbureter*
9. *Check and adjust spark timing*
10. *Test on road for "pick-up" and "idle"*

When the owner gets a bill briefly stating "Clean Carbon and Grind Valves—$12" he is apt to feel that the bill is too high for a job explained so easily. A plan that has worked with much success and is used by the Stuyvesant Motor Co., Cleveland, in selling service is to itemize each operation in the whole job. This makes a lengthy list and the owner can readily realize the amount of work that was necessary and rarely questions the charge



The whole superstructure of the Sunbeam cars is offset to counteract the effect of centrifugal force. By this construction the weight is caused to balance more nearly equal on all four wheels when taking turns

Foreign Cars Strong Contenders in Indianapolis Race

Many European Mounts Specially Built for This Year's 500-Mile Event—Their Description Here Discloses Many Interesting Details of Construction

FOR many a race back Indianapolis has not had the list of eminent drivers that it has billed for this year's race. There are approximately twenty-five famous drivers and mounts already entered and each man is more than ever determined to be the winner. There are two good reasons why the drivers are so anxious to win the Indianapolis 500-mile race this year: One is that the honor and points in the national racing events is largely decided by the showing of the driver winning at Indianapolis, and the other is that the prize is one worthy of any attempt. A two hundred dollar per lap award is being granted this year and this in addition to the regular prize award brings the possible total to about $100,000.

SUNBEAM AND TALBOT-DARRACQ ARE EIGHTS

Several new cars will be entered this year and from the way these cars have been tested and are being tested and judging from the experience of the men behind the cars it is necessary that these be considered as factors in the race. We refer to the new Sunbeam cars entered by the veteran Louis Coatalen and to be driven by Rene Thomas and Dario Resta and to the new Peugeots entered by Jules Goux and Jean Chassagne and to be driven by Howard Wilcox and Chassagne. The Talbot-Darracq is also a Coatalen design and will be piloted by Andre Boillot.

The two Sunbeam and the Talbot-Darracq cars are eight cylinder in line productions designed by Louis Coatalen and built in the Sunbeam shops at Wolverhampton, England.

The eight cylinders are in two aluminum alloy castings, of 65 by 112 mm. (2.5 by 4.36 in.) with shrunk in steel liners and phosphor bronze seats for the four overhead valves per cylinder. The valves are operated by two hollow camshafts mounted in ball bearings and contained in aluminum housings, with drive by a train of spur pinions also mounted in ball bearings, and contained in an aluminum housing at the front of the engine.

The crankshaft, which has its rear half at 90 deg. of the front portion, is carried in five plain bearings and is considerably hollowed for lightness. It is understood that very massive webs are used, and there is no flywheel. Connecting rods are I-section, of very fine section, but with very massive heads, the cap being held by four bolts. Aluminum alloy is used for the pistons and the piston pin floats in both the rod and the piston.

Lubrication is of the dry sump type, with forced supply to the main bearings, through the hollow crankshaft to the connecting rod bearings, and also through the hollow camshafts. A scavenger pump returns the oil to the supply tank under the feet of the mechanician. Although designed to run either with magneto or Delco, it is understood that this latter will be used at Indianapolis. The distributer is placed in the middle of the engine, between the two carbureters, and is driven by skew gearing from a shaft from the distribution gear. There is one plug per cylinder.

A sub-frame, mounted in the main frame by a trunnion attachment at front and by two links at the rear, carries the engine and the four speed gear set. This sub-frame is slightly inclined downwards towards the front, the center line of the engine being rather nearer the ground than the center line of the rear axle.

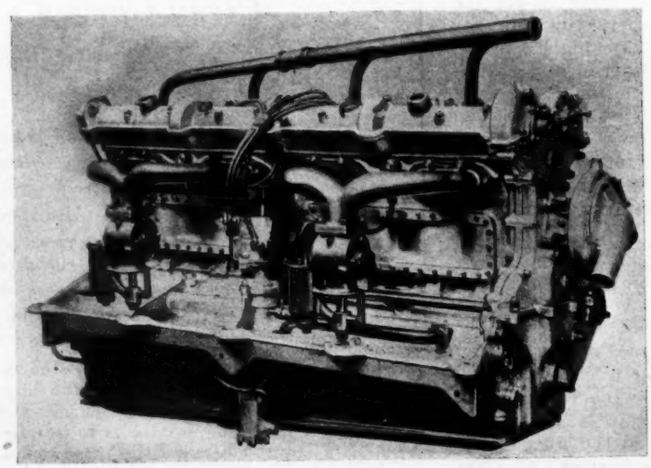
There is a frame kick-up over the front axle and also over the rear axle. Semi-elliptic springs are employed front and rear, and are mounted under the axles in each case. An open propeller shaft is used, with a sliding square nut type of joint at the front and a Hooke type with Timken roller bearings at the rear.

The springs take the drive and torque. Rear axle construction is taper steel tubes machined from forgings, and a central casing of aluminum. For Indianapolis the cars will have transmission and rear wheel brakes, but the front axle has been laid out for Perrot front wheel brakes, and these will be used in the French Grand Prix. For Indianapolis, too, the entire chassis is offset to the left, so as to assist in turning to the left.

Immediately after the American event the three cars will be shipped to France to be prepared for the Grand Prix road race to be held on July 25.

Peugeot is sending two racing cars to

The Sunbeam 100 Hp. Eight-in-Line Racing Engine



Carbureter side of the Sunbeam eight - cylinder - in-line racing engine. The cylinders are of aluminum with steel liners, and phosphor bronze seats are used for the overhead valves. The two aluminum blocks with steel liners forming the eight cylinders of the Sunbeam racer can easily be carried by one man, a remarkable fact considering that 100 h.p. is developed by the engine

Indianapolis for the 500-mile race on Memorial Day, the machines to be driven by Jean Chassagne and Howard Wilcox. The cars are not entirely alike, for while Chassagne's mount is an entirely new production, the one to be driven by Wilcox is new only so far as the engine is concerned, the chassis being one of the 1914 2½ litre types, built for races which never were held.

The engine of the newer car has four cylinders in a single casting of 80 by 148 mm. (3.1 by 5.8 in.) bore and stroke with four overhead valves per cylinder operated by two camshafts, and a train of spur pinions contained in an aluminum housing at the front. The general arrangement of the valves and valve gearing is similar to that of the Peugeots built before the war. In this connection it will be noted that the five valve design with three camshafts adopted by Peugeot a year ago has been entirely abandoned.

The crankshaft is carried in three ball bearings, and annular ball bearings are also used for the camshafts, the timing gear pinions and the engine accessories. To help reduce weight the water jacket walls have been cut away for the full length of the engine, on each side, and are replaced by aluminum plates.

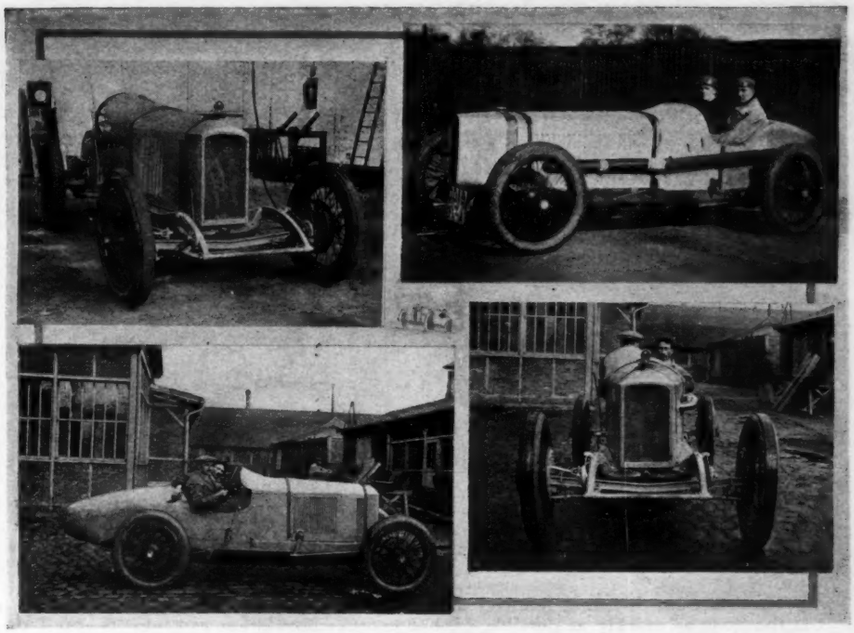
IGNITION CAN BE EASILY CHANGED

Ignition is by means of a high tension magneto firing four plugs placed vertically in the center of the combustion chambers. Two magnetos are mounted side by side on aluminum extension bases ahead of the timing gear housing, but only the right hand magneto is driven. This is due to the fact that it is not certain whether the cars will be run in the Indianapolis race with magneto equipment or with Delco ignition.

The two bases are designed to receive respectively the Delco generator and the distributer, so that if it is desired to make a change this can be carried out with the minimum of trouble. All the bench and road tests in France have been carried out with magneto ignition only. The carbureter used is a single Claudel, with a T-shaped manifold, each extremity of which has two extensions to the individual ports.

Lubrication is of the dry sump type, the main quantity of oil being carried in a tank within the frame members, and delivered to the main bearings through a distributer, which also supplies oil to a secondary distributer feeding the two overhead camshafts. The glass sight feeds on the dash have been omitted. This engine forms a unit with the clutch and the gearbox and has four point attachment to the frame members by means of two tubes passing through the crankcase and having their extremities received in split bearings mounted on the side members. It will be remembered that on the earlier types a subframe was used.

The clutch is multiple disk type. Four speeds and reverse are provided, final drive being by means of open propeller shaft, with double universals, on the Hotchkiss principle, and bevel gearing. Springs are semi-elliptic front and rear and in both cases are mounted under the axles. The frame has a decided kick up over the rear axle and over the front axle, thus helping to get the center of gravity low.



Some Entries in Indianapolis Race

Upper left—One of the Peugeots which will battle for the fortune in prizes at Indianapolis May 31. Upper right—Major H. O. D. Seagrave in the eight-cylinder Sunbeam designed by Louis Coatalen for the big event. The two lower views are those of Jean Chassagne in the Peugeot. "Howdy" Wilcox will drive one of them

FOUR WHEEL BRAKES RETAINED

When these chassis were laid out it was supposed that the cars would run in the French Grand Prix road race, with the result that front wheel brakes were provided for. These have been retained, although not really necessary for track work. There is no brake on the transmission and the side lever is used to operate the rear wheel brakes and the pedal works on the front wheels. The frame is narrow, and the body has been kept to the narrowest possible limits. A tail is fitted, and inside this is a gasoline tank containing sufficient fuel for 300 miles.

Both cars are being shipped from France with straight side rim equipment, the size being 32 by 4½ in.

The dimensions of the engine to be used by Wilcox are 85 by 130 mm. This is an entirely new engine laid out to meet the original conditions of the French Grand Prix, which called for a minimum power of 30 at 1000 revolutions, and 90 to 3000 revolutions a minute. Although almost similar in external appearance, this engine has several internal features differentiating it from that used by Chassagne, and on the bench it has developed slightly higher power. Lubrication is of the dry sump type with all the oil drawn from a tank carried within the frame, delivered through dashboard sight feeds to the engine, and returned from the base chamber by means of a scavenging pump to the main supply tank. This is the system used by Peugeot before the war.

The engine and gearbox are separate units mounted on an elongated U-shape subframe hung in the main frame by means of three trunnions. This also is a pre-war feature. There are four speeds and reverse, with double universal jointed shaft and Hotchkiss drive. This car also has front wheel brakes and straight side tire equipment. On both cars weight has been kept lower than on any previous Peugeot productions. The cars weigh 1760 lbs. with full equipment.

Greatest Race Entry

Car	Driver
ReVere Special	Eddie Hearne
Ballot Special	Ralph De Palma
Leach Special	Ira Vail
Durant Special	Tommy Milton
Duesenberg Special	James Murphy
Duesenberg Special	Roscoe Sarles
Duesenberg Special	Edw. Miller
Duesenberg Special	Eddie Pullen
Frontenac Special	Ralph Mulford
Frontenac Special	----------
Peugeot Special	Howard Wilcox
Talbot-Darracq	Andre Boillot
Sunbeam Special	Rene Thomas
Sunbeam Special	Dario Resta
Junior Special	R. J. Brett
Junior Special	Joe Thomas
Peugeot Special	Jean Chassagne
Duesenberg Special	Bennie Hill
Frontenac	Jules Ellingboe
Chicago-Frontenac	Percy Ford
Duesenberg Special	Joe Boyer
Duesenberg Special	Albert Guyot
Frontenac Special	C. W. Van Ranst
Frontenac Special	L. L. Corum
Frontenac Special	M. E. Headley

There are no diverting features at the Chicago used car show. The primary idea is to sell cars and to get them off the floor as quickly as possible so that another unsold car can take its place. While a few accessories, bodies, trucks and motorcycles are exhibited the greater part of the space is taken up by the cars. Every inch of available space is made use of

Selling Used Cars at a Show

Other Cities Have Tried to Do It But Few of Them Have Found It Profitable—Chicago, by Gaining Confidence of the Public Through No Misrepresentation, is Now Putting on Its Fourth Annual Exhibition

CHICAGO, May 9—The fourth annual used car show is occupying the center of the stage here this week and it is giving renewed indications that despite the present ready sales of new cars in this section there is just as brisk a demand as there ever was for used cars. At the time of the price reductions last September the used car market suffered somewhat but its recovery has kept pace with the return of the market for the manufacturer's newer product and today Chicago is holding up to its established reputation as probably the largest used car market in the country.

The show is being held in the Coliseum where the national automobile shows are staged and the three hundred cars exhibited, all of models made in 1920 or before, together with a few lines of accessories, motorcycles, trucks and bodies take up all of the eighty-one spaces into which the huge building has been divided. There are fifty-one car exhibitors, with their displays in conformity, each one a member of the Chicago Automobile Trade Association under whose auspices the show is being held. There are no exhibitors who are solely dealers in used cars.

THIS is a selling show pure and simple. There are no diverting features. Each car bears its price; it stands ready to be driven away when the terms of the sale have been settled upon. Trade-ins are accepted. The show will develop prospect lists but its primary aim is to sell during the nine days that the show is in progress and to sell, not so much out of the dealer's salesroom, as directly off the floor.

The exhibits are constantly changing through the replacement of cars sold with others, perhaps of the same model but perhaps at different prices.

Other cities have tried to stage a used car show; some have succeeded after a fashion; others have failed so conspicuously that they have given up to the idea that a show of this sort can be staged with any profit. Last year Chicago's show was so handled that 23 per cent of the cost of putting it on was returned pro-rata to the exhibitors and it is expected that an equally good, if not a better showing will be made this year. The thing in back of the success was winning the confidence of the public—showing the public that what was being offered was real, that there were no misrepresentations, that every car exhibited was exactly what it was represented to be.

EACH CAR INSPECTED

The trade association prepared the public for the exhibit this year through newspaper advertising, full pages being employed in the issues of the Sunday immediately following the opening day, and through placards distributed generally through the business section of the city and displayed in store windows. The show opens at 10 a. m. and closes at 10 p. m. and is open Sundays.

The fact that the show is sponsored by the trade association provides a certain guarantee to the public. Further guarantee is given through the close inspection to which every car must be submitted before it is allowed into the Coliseum and to the space allotted to the dealer-owner. This inspection, which is of the most rigid kind, plays possibly the most important part in the display. The green card that is attached to every radiator cap as a result of this inspection is a guarantee to the buyer that the car, after having been given

a road test and after having its mechanical condition and the price set by the dealer-owner investigated, is in good shape and is worth the price shown on the card.

Though there is no individual guarantee attached to any car, it is worthy of note that of all the sales made in the four previous displays only one car was returned as not giving satisfaction and in that case a refund was made to the purchaser and the dealer selling the car was made to stand the loss. That car inadvertently had slipped by the Mechanical Inspection and Appraisal Committee.

This committee is composed of three members all affiliated with dealer establishments along the row. Before the show opened it had its headquarters on a vacant lot on South Michigan avenue near Twenty-second street, which is the heart of the automobile district, and there received the cars as they were sent by the dealers. Upon receipt each car bore a brown card setting forth the claims of the dealer. These various claims, inclusive of the price, were checked over and notations made on the back of the card of points where the car fell short. Those cars that did not meet the claims were returned to the dealers and the others, found to be in the shape as set forth on the card and up to the standard as fixed by the committee, were green-ticketed and thus admissable to display. As a car is sold on the floor of the Coliseum a red ticket is attached to it.

REBUILT AND REFINISHED

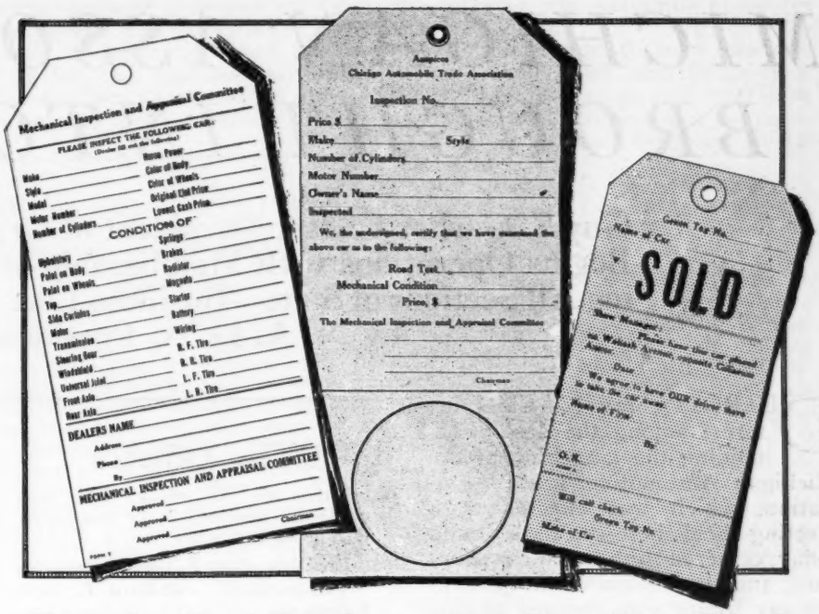
The cars that are being exhibited are not patched up affairs, veneered so that they will look as good as new, but are what they are said to be—rebuilt cars. Their tops are as good as new; there is not a flaw in them. Their upholstery is as if the car just came new from the factory. Their engines have been put in smooth running order. The prices remain without change as they were when they received the approval of the inspection committee.

The public confidence has been won through previous shows and the association is intent upon keeping it.

There is just as active salesmanship apparent at this show as at the new car shows because a buyer of a used car must be sold on the car just as well as the purchaser of a new car. And he must be sold quick or he will go to some other booth and a more alert salesman will be able to negotiate the deal which the first salesman should have been able to put through.

A PLAN TO GET PROSPECTS

As a stimulant to sales endeavor the management prepares a bulletin at the close of each day showing a record of the cars actually sold and removed during that day. This record includes the name of the dealer, the make of car, the type and the price; the total cars disposed of and the total value of the sales. It also shows the paid and free admissions for that day compared with the corresponding day a year ago.



How the Used Car Inspection Committee Works

This brown card at the left is attached to the car as it reaches the mechanical inspection and appraisal committee. If the condition is not as set forth the car is returned to the dealer with notations on the back of the card. If the car is accepted by the committee it is tagged with a green ticket, shown in the center, duly signed by the committee with the stamp of the trade association in the lower portion. The card admits the car to the Coliseum. When a car is sold the red ticket at the right is attached

For instance on May 7 of this year, the opening day, the total cars sold were fourteen, representing a value of $16,685. On the same day there were 432 paid and 642 free admissions; April 28, last year, which was the opening day, the paid admissions totalled 376 and the free admissions 746. This record, mimeographed, is placed in the mails so that it reaches every member of the association early the following day and a copy is placed in the hands of the person in charge of each booth. By scanning the list the dealer is able to see what dealers handling the class of cars that he sells have been able to negotiate sales which his salesmen might have made.

The management has instituted a plan whereby each purchaser of an admission ticket, the price of which is 40 cents, writes his name and address on the stub and drops it in a box. At the end of the day these stubs are gathered and a list of the names and addresses is compiled and sent to the association headquarters where it is available as a prospect list to any member of the association desiring it. The dealer generally knows to whom his complimentary tickets go and through the compiling of the paid admission list he is able to find who the persons are who are interested enough in a used car to pay their way to see a used car show. This prospect list can be worked for both new and used car future sales.

The show doubtless will stimulate interest in used cars but it will accomplish more than that—it will actually move used cars immediately and at a profit to the dealer and that is the principal objective. And it will give some of the dealers pointers on what is needed, in the way of added accessories and the like, to make the individual exhibits more appealing to the prospect.

Co-operation to Sell Used Cars in Wisconsin Capital

Madison, Wis., May 16.—Fourteen of the leading distributers and dealers with headquarters in Madison, state capitol of Wisconsin, have organized the Madison Used Car Co., a $50,000 corporation in which each will hold an equal number of shares. The co-operative effort carried out to this extent is the first in Wisconsin. The new corporation has become an active factor under the management of H. H. Hites. An exclusively used car salesroom and office has been established to accommodate about 100 passenger and commercial cars.

The function of the new institution will be the centralization of the work of purchasing and reselling used cars, relieving a great number of individual dealers from the arduous phases of the problem by co-operative handling. Dealers who are stockholders will accept due bills from the corporation on the purchase price of new cars or trucks, the due bills representing the highest market value of the used vehicle within reason. Heretofore the allowance and resale price of a used car was determined in many cases by the views of buyer and seller, resulting in a wide difference and oft-times an unfair valuation.

MICHIGAN ASSOCIATION BROUGHT INTO BEING

Guy S. Garber Chosen President of Organization That Begins Operations with Membership of 250 Representing All Sections of State—Business-Like Methods Urged by N. A. D. A. President

DETROIT, May 12—Chief interest among the dealers attending the launching of the Michigan Automotive Trade Association, which was effected at a meeting held here yesterday and today, centered in the used car problems, and the session of the passenger car forum was devoted almost entirely to that phase of the business. The evils attendant upon the trade-in as practiced by many dealers brought forth much condemnation and many suggestions were offered for remedying the evil.

The association was started under most enthusiastic auspices with a membership of 250. The sessions began yesterday morning and continued throughout yesterday and today with a frolic last night at which the state dealers were guests of the Detroit Automobile Dealers' Association. This afternoon was spent in forums divided into passenger car dealers, truck dealers and accessory dealers. A. E. Becker of Grand Rapids led the passenger car forum, H. R. Graham of Detroit, the truck forum, and E. F. Patterson of Kalamazoo, the accessory division.

FIVE CLASSES OF MEMBERSHIP

With the adoption of the report of the committee on constitution and by-laws yesterday morning the association formally was launched, but the actual signing of the roll and checks for the first year's dues was postponed until the banquet last night. The constitution provides five classes of membership.

Class "A" is confined to distributors doing an annual business of $250,000, dues for which were fixed at $100. Class "B" is for jobbers in accessories with dues of $90. Class "C" takes in the motor vehicle dealers who are not distributors and the dues were fixed at $35. Class "D" includes accessory dealers who are not jobbers and dues are $25. Class "E" takes in general repair and garage men who are not dealers in motor vehicles nor accessories. The dues for this class were fixed at $15.

Jesse A. Smith, president of the N. A. D. A., was a guest of the Detroit Automobile Dealers' Association at the banquet last night and felicitated the members of the new association on the enthusiasm with which the organization was launched. Smith told of the splendid efforts of the organization in his state and declared of 37 bills offered to the legislature inimical to the automotive industry, 27 already had been killed. He said the remainder of them also were destined to be disposed of without serious injury to the industry.

Smith advocated a discontinuance of the practices that injure business and urged the dealers through co-operative effort to conduct their business in a business-like way and assured them that with combined efforts they must succeed in development of their own institutions as well as aiding in the progress of the entire industry.

PRAISES N. A. D. A.

F. W. A. Vesper of St. Louis, former president of the N. A. D. A., also spoke to the guests at the banquet in which he told of the successful efforts of the national association in combating adverse legislation and in the many other ways it has aided the 35,000 dealers throughout the country.

Vesper declared the automobile business was one in which those interested had just slipped in, and said it was a good many years after the industry was established before those most vitally concerned took confidence in it and began to realize it was not a luxury business as was presumed at the start, but rather an essential industry. He told of the efforts at Washington during war times when the national association was in swaddling clothes and recited how the few men who then composed the organization had overcome governmental prejudice and saved the industry.

The convention was called to order yesterday morning by Mr. Garber who had been named chairman at a previous meeting when plans for the organization convention were laid. Capt. W. S. Gilbreath of the Detroit Automobile Club delivered a welcome to the visiting dealers on behalf of Gov. Groesbeck and urged the association plan as the best method for the dealers to secure their rights. He said heretofore the factory had told the dealer what to do but with combination and co-operation the men in the organization about to be formed would be in a position to do what they wanted to do themselves.

In response Chairman Garber told of the growth and development of the automotive industry in Michigan and declared the dealer was the energy which kept the factory going in selling and servicing motor vehicles. Garber said the efforts of the dealers have builded a foundation that will stand through all time and carry the industry through the trials and depressions that are necessary to all business. Concerted effort, he said, would tend to develop the entire resources of the state as well as the industry, and the dealer's own private interest.

MOOCK GIVES TALK

He cited registration figures showing that in 1916 there were in Michigan 682 dealers and in 1920, 1,638. Revenues for 1916 he said were $1,739,343 and in 1920, $5,754,000.

Harry G. Moock, manager of the N. A. D. A., addressed the morning session and told the dealers they all had wonderful opportunities to prove to themselves whether they have confidence in their own business. He said the automobile business was a romantic one and cited the instance of a man in California who today heads one of the greatest institutions in that state allied with the industry, and who a few years ago arrived in the golden state with $45. The time of running a nickel into a million, however,

The Officers

These are the officers who will guide the destinies of the association during its first year:

President—Guy S. Garber, Saginaw.

Vice-president——Richard E. Fair, Kalamazoo.

Treasurer—Clark R. Graves, Lansing.

Directors

G. E. Northroup, Grand Rapids.
James Woodward, Bay City.
J. J. Tompkins, Saginaw.
George Simmons, Flint.
Gilbert Loomis, Jackson.
C. A. Mitchell, Bay City.
John Cawood, Port Huron.
F. E. Hathaway, Port Huron.
W. J. Bemb, Detroit.
L. W. Sherer, Benton Harbor.

has gone, Moock said, and the period has arrived for work and hard concerted effort and deep thought. Individuality, he said, must count, and declared it was up to every man to so conduct his business as to continue in the future or pass into oblivion. Moock declared the real battle had not started and said no man was going to keep his standing with his factory unless he worked and thought and planned to develop methods of selling transportation that would enhance and develop the efforts of men who are manufacturing his product.

Moock urged harmony and close association with competitors, deplored mistrust and suspicion, which he declared as a matter of fact in most instances was engendered by reflection of one's own individuality. He urged that the state association was necessary to the welfare of the dealers and told of some of the efforts of the national association where great obstacles had been overcome that might have meant ruin but for the strength of the organization combating them. He urged upon dealers not to criticize the association if its progress is not as rapid as might be hoped for and emphasized that only as they gave to it of their ability and energy, would it succeed.

WARNS AGAINST BOOTLEG EVIL

Active participation in political and civic affairs was urged by Moock who cited the case of Iowa and Washington where automobile men had been elected to office as a result of which great benefit had accrued to the industry in those states. Moock again took occasion to caution dealers against the bootleg menace and urged them not to sell on credit without insurance against confiscation for violation of revenue laws. In closing he told the dealers that just as they moved along and injected their own energy and effort would their association develop and succeed.

He said the meeting Monday between a committee representing the manufacturers and the dealers marked an era in that it was the first time in history that the dealer had been given recognition as an integral part of the industry by the manufacturers. Many suggestions made by the dealers in that meeting, he said, had been received in the kindliest spirit by the manufacturers with the result that regular meetings between the two branches will be held in the future and all differences ironed out, all of which he said was due to association activity that has made the dealer powerful in his own sphere.

Wayne Hearne in speaking on salesmanship and automotive merchandising declared at the outset that there was no such word as salesmanship to be found in the dictionary, but said it was coined to express certain qualities and if taken in a broad sense meant everything. The word, he said, had been defined as the power to persuade the public to purchase at a profit, for no sale can be a success unless there is mutual profit derived, the customer getting his in the satisfaction of having received full value.

Hearne declared salesmanship could not be taught, that an employee could be armed, equipped and trained, but unless he had the characteristics within him he had better not make an attempt to do business for his employer. He referred to the difference between the salesman and the sales maker, and declared if the salesman was worth 5 per cent the sales maker was worth 10.

What the Dealers Were Told About Service

PERCY E. CHAMBERLAIN in speaking from a service angle and the relation that service bore to sales declared that dealers paid for brains and intelligence and opportunity in the men who sell their cars but allowed anybody to sell customers any amount of service to the greatest detriment of their business. The REPEAT ORDER, he said, was the big factor and unless proper attention was given to service and the proper men and methods used in applying the policies of the dealer the repeat order was gone.

Only by courteous, efficient and friendly interest and opportunity to sell would the dealer succeed in that end of his business, he said, and declared that SALESMANSHIP IN SERVICE is just as important as in any line of merchandise in the fact that it is the point of contact with the customer. He urged that only high class men of ability be used in the effort to win the customer's confidence.

GIVES NECESSARY QUALIFICATIONS

Hearne suggested six points necessary in a man well qualified to sell motor vehicles—work, reliability, courage, receptiveness, knowledge of propositions and the power of speech. Knowledge of propositions, he said, he would put at the head of the list and he would insist that any salesman be qualified to answer any questions that might be asked him intelligently.

For a long time, Hearne said, the dealer had been existing on the old argument to the customer, "If you want this car you had better buy it quick or you may not get one." Some day, he said, there will be two cars to every buyer and the public will remember these times. He urged the dealer to get confidence and knowledge of his product instilled into every man in his organization from the porter up, if he would succeed.

The second quality he would require, Hearne said, was work, not like the dealer today thinks he is doing it, but real hard, consistent work.

Reliability was the third requirement, he said, and while it alone has no commercial value, and might be good for a night watchman, it must be coupled with the other requirements in the make-up of a competent employee. Courage, he said, was a prime asset and he deplored the salesman who was afraid to ask for the order.

The prospect can't do more than kick you out, said Hearne, and that is much better than to have to duck your head and crawl out. He urged that the salesman should keep on asking until he got his order.

The session today opened with a report of the committee on nominations, followed by the election of officers, after which Harry Meixell, secretary of the motor vehicle conference committee of New York, delivered an address on automobile legislation. Meixell told of conditions affecting the automobile as they exist in all legislatures, and in the progress of the efforts that had been and are being made to combat them. The success of the industry today, he said, was due to a great extent to the efforts of the National Automobile Dealers' Association, and declared that in states where the dealers had well organized the state associations less troubles was found in overcoming the prejudice of the legislators.

TALKS ON DEALER CREDITS

Dealer financing was discussed by S. S. Stratton, president of the Commercial Acceptance Trust Co. of Chicago, who spoke on fundamentals of automobile dealers financing. Stratton urged conduct of business in such manner as to win the confidence and good will of bankers. He declared the banker was simply a human being who had money to sell and that no man with a clean record and a good sound business need have any fear approaching his banker for financial help.

He urged more caution in the disposal of vehicles and careful scrutiny of a prospect's ability and willingness to pay. He said the banker watched that end as closely as he watched every other end of the dealer's business and the dealer who was given to selling automobiles on terms not in accord with good business principles would be frowned upon by the banker when it came time for him to seek assistance.

The convention adjourned this afternoon with the close of the forums and the report of the resolutions committee. The committees which conducted the business of the organization and launched the new association were as follows:

Constitution and by-laws—H. R. Graham, Detroit; G. E. Davenport, Grand Rapids; R. E. Fair, Kalamazoo.

Membership—G. O. Simon, Detroit; William Peiter, Grand Rapids; W. J. Doughty, Detroit; R. P. Bishop, Saginaw; H. E. Loomis, Battle Creek.

Finance—C. R. Graves, Lansing; A. L. Zechendorf, Detroit; A. S. Levinsohn, Saginaw; Ray Becker, Grand Rapids; Mat Davison, Flint.

Nominations—W. J. Bemb, Detroit; Ed Lunt, Flint; J. J. Tompkins, Saginaw; W. B. Dunn, Jackson; Fred Kramer, Grand Rapids.

Resolutions—C. C. Starkweather, Detroit; M. L. Garlock, Lansing; C. E. Zang, Battle Creek; Gilbert Loomis, Jackson.

Practical Tire Merchandising and Repairing

by Stanley P. McMinn

Handling the Sales Force

Personal Solicitation Best
Intensive Selling Necessary
Persistency Essential
Compiling a Prospect List
Methods of Approach
Getting Winter Business
Selling Tires on Time
Soliciting Repair Work

FOR real results no form of sales effort can compare with personal solicitation. Man is most interested in man. It is unprofitable to overlook the tremendous advantage of the personal element in salesmanship. That in brief is the reason for the thousands of traveling salesmen who spend their days in the cities and their nights between them.

Newspaper advertising, various forms of circular letters, billboards, hand-bills and the like all have a definite value and a specific place in the merchandising plan, but for the signature on the dotted line you must fall back on the salesman.

Advertisements keep your organization and your product before the public but in the end they serve almost entirely as a means to pave the way for the salesman. The salesman is the real "go-getter."

A SELLER'S, NOT A BUYER'S MARKET

All this is particularly true at the present time. Conditions have changed materially and we now have a seller's market instead of a buyer's market that has existed for the past year or more. So it behooves the real tire merchant to pay particular attention to sales effort.

The public does not "buy" things now. The public must be sold. If you have the goods, a reasonable amount of sales effort will give you the business; and always remember that on the market that may be temporarily failing, a proportionately greater sales effort is needed to maintain normal volume.

The disposal of tires and repair service does not require any very extensive training on the part of the salesman. Fundamentals of salesmanship are the same regardless of the product to be sold. Hence, a salesman who has made good in any other line is almost certain to be successful in the tire business.

He will appreciate for example, that in selling tires it is just as necessary (1) *to get the prospect's attention,* (2) *arouse desire and* (3) *stimulate favorable action* as it is in selling anything else. The mere fact that tires may differ from the merchandise he has been selling in the past is an unimportant detail. Any person of average intelligence can learn enough about tires and tire construction in thirty minutes to be able to talk convincingly to anyone other than a tire expert.

Just as the constant dripping of water will wear away a stone, so will the constant calls of a salesman eventually result in business. Results are certain if sales effort is planned and carried on in the proper way.

KEEP EVERLASTINGLY AT IT

The important point is to keep everlastingly at it. No matter if John Jones turns the salesman down every week for seven or eight weeks. By that time even if no other object has been attained, the salesman's product is at least firmly fixed in the mind of the prospect.,

Innumerable cases might be cited where after five or six calls that have all been unproductive, the prospect has telephoned the dealer and the business has been closed over the 'phone.

A SURE-FIRE WINNER

Persistency tempered with common sense and courtesy are sure-fire winners. But the salesman will not be persistent unless he has a definite plan upon which to work. Salesmen in general cannot be trusted with the working out of such a plan. That is logically the work of the proprietor or the sales manager or some person whose duty it is to guide the efforts of the sales force.

Unless given a particular task to perform your salesmen will wander about looking for prospects and perhaps never find them. Therefore, it should be someone's duty to supply the salesman with a list of prospects every morning before he leaves the place of business.

For this, perhaps, nothing can compare to an up-to-date and accurately maintained prospect file. Such a file may be started in any one of a number of ways. If registration lists of car and truck owners are available, plenty of names can be obtained from these.

It is foolish to attempt to list all the names at once. List the first day, 18 or 20 names of people who you believe would be in the market for tires. This is a starter for the salesman. Impress upon him the necessity of calling on each one individually. See to it that at the end of the day he gives you a definite report on each one of them.

KEEP PROSPECT LISTS ALIVE

On the second day repeat the process, choosing an equal number of new names. Repeat the process each day of the week and when the new week is started, return at once automatically to the persons who were interviewed on the first day of the campaign. In addition, provide the salesman with half a dozen new names.

In brief, it should be the object of

SA-5

Name Heaton, Abram Date Sept. 13/19

Address 1320 E. Main St. Size Tire PacK

Telephone Salesman McM

FOLLOW UP				RECORD OF SALES			
Date	Letters	Store Calls	Salesman	Date	~~Half Soles~~	Tires	Tubes
Sept 20	✓				Repairs		
" 27			✓				
Oct 5		✓		Oct 5		34×4½	36×4½

REMARKS

Spare in front Condition

Fig. 1 — On the prospect card will be found all the data concerning the various visits made by the salesman as well as the products on which the salesman has quoted or which may at some future date be required by the prospect

the salesman to call once a week on every name on the prospect list and in addition interview a definite number of new prospects every day. The prospect list will be kept alive quite automatically under this plan. Dead names will be removed and a sufficient volume of new ones added from day to day to keep the list of sufficient size to provide the salesman with a definite job for every minute of every day.

Such a list of course, rapidly becomes an extremely valuable mailing list. On the cards, Fig. 1, wil be found all the data concerning the various visits made by the salesman as the products on which the salesman has quoted or which may at some future date be required by the prospect.

It should be one of the duties of the proprietor or the person directly under whom the saleman is working to check over, every day, the calls that have been made. In this way the salesman and his immediate superior are bought into closer contact. Many times the proprietor can make helpful suggestions to the salesman and vice versa.

If no list of motor car registration is available, the prospect file can be built up very easily from such an humble source as the daily newspaper. Regardless of the source of the prospect file, the important point is to get names and to see to it that each of these names is conscientiously canvassed. The telephone book, and particularly the classified section, is a prolific source of prospect names.

Satisfied customers are another source of names. Such customers are always glad to give the names of friends or acquaintances and in this case the salesman is furnished with a ready-made introduction.

Too much emphasis cannot be laid upon the necessity for the salesman making regular calls on his prospects. Even though he may be given a very decisive "NO" he should still keep up his regular visits. They make him better acquainted with the prospect and business methods, all of which in time become valuable to the salesman and to the house.

ALWAYS ASK FOR BUSINESS

Impress upon the salesman the urgency of making every call every time and NEVER LET HIM FAIL TO ASK FOR BUSINESS EVERY TIME HE CALLS.

It is all very well for the salesman to pass the time of day with a prospect or to talk base-ball or the latest prize-fight. That is expected. *But don't let the salesman forget to ask for business.*

Prospects dislike to say "No." They would much rather say "Yes." Many otherwise good canvasses become useless for the simple reason that the salesman never asks for the business in just so many words.

It is not within the province of this article to attempt to outline the qualifications that a tire salesman should have or to delineate the methods by which a good salesman may be distinguished from a poor one. Suffice it to say that the man who is picked for the job should have a pleasant personality and should be equally capable of interviewing both the highly educated purchasing agent of an important industrial concern and the rough-neck truck driver employed by the same company. In short, he should be a good mixer.

METHODS OF APPROACH

Methods of approach vary. One plan that has been found very valuable is to provide the salesman with some simple advertising novelty that will serve to "break the ice" of the first few minutes of talk and also to keep the salesman and his product prominently before the prospect.

In this respect, miniature pocket calendars are good. Advertising lead pencils are better. A lead pencil is never thrown away. One dealer who chose this method of hand-to-hand advertising, so to speak, very soon discovered that pencils were almost worthless unless sharpened. When given away unsharpened they were likely to be thrown into the drawer of a desk. When sharpened they immediately went into the pocket of the recipient.

Little things like this help to cement the bond of friendship between the salesman and the man upon whom he is calling. They are also a very mild form of bribery; they place the prospect under an almost imperceptible obligation. They give the salesman an advantage that your competitor's salesman may not have.

SELL REPAIRWORK, TOO

There is no real reason why a salesman should confine his efforts to the sale of new tires. He is just as capable of selling tire accessories and repairwork. In fact, an opportunity to sell a a repair job will often present itself when the prospect says "No" on a new tire.

The salesman should make it a regular practice to go through *all* the motions. He should inquire regarding the need for new tires, for tubes, for non-skid chain equipment, for tube and casing repairwork and if the dealer handles them, accessories.

If the salesman is sufficiently versed on the construction of tires and on the ills they are heir to, and thus is in a position to make inspections, that, also, serves as an excellent reason for a weekly visit. Customers like to know that the house they are dealing with takes sufficient interest in their equipment to want to see it maintained at maximum efficiency.

MAKING TIRE INSPECTIONS

Inspections of the kind should cover such things as abnormal tread wear due to wheels being out of alignment, unnecessary side-wall wear due to curb scraping; tread cutting largely resulting from running in car tracks; treads cut by sagging fenders or protruding fender bolts; misadjusted or broken wheel bearings; loose rim fastenings, etc.

The owner of the equipment, unless he be also the driver, is seldom in a position to know of these various faults which bring the tire prematurely to the scrap heap. The result of such inspections should always be placed before the car or truck owner in the form of a regular standard report.

SELL FOR FUTURE DELIVERY

An important point to impress upon the salesman is the fact that though it may be difficult to close a sale at once due either to financial conditions of the prospect or to the fact that he may not require tires at that particular moment, it may be possible to sell the prospect the idea of signing an order for delivery at some future date.

The winter months are particularly hard months for the tire dealer in many sections. However, industrious sales effort very frequently will be productive of a good volume of orders for tires to be delivered early in the spring. When the snow is on the ground and sales have fallen flat, is the time for the salesman to get out and plug for spring business.

A good volume of orders on the books helps the credit standing of a dealer. His bank will be more amenable to that particular kind of reason. The bank will be more apt to extend credit to the dealer who has the business acumen to gather in orders when other dealers are sitting back and bemoaning the condition of trade.

GET A PROMISE, AT LEAST

Even if the salesman cannot get a signed order whether it be for immediate delivery or future delivery, he should at least attempt to get a promise. Such promises are often broken, but they are just as often not broken.

A prospect who promises business to a salesman is under a moral obligation at least to give the salesman the business.

Handling the Sales Force

(Continued next week)

What You Need to Know—

about the tire business will surely be found in a series which goes thoroughly into all the phases of the business as listed below—Don't miss any of them.

3—Handling the Sales Force.
4—Letters and Post-Cards.
5—Advertising.
6—Window Displays.
7—Salesroom and Office.
8—Service Station Facilities.
9—The Service Station.
10—The Service Car and Its Equipment.
11—The Repair Department.
12—Equipping a Shop.
13—Tube Repairing.
14—Fabric Tire Repair.

EDITORIAL

The Fixed Price System

IT IS gratifying to observe how keenly interested dealers and operators of service stations are becoming in the fixed price or flat rate plan of selling service. When this system first was advocated some two years ago there were many who shook their heads and said it couldn't be done. One couldn't tell what he was apt to find on tearing down an engine, so how could the car owner be told just what the cost was going to be? And so on.

But, as has often been said, the proof of the pudding is in the eating. And to-day we find some of the former objectors to the fixed price system using it with the greatest satisfaction. They are unbounded in their enthusiasm. Not only has it helped practically to eliminate contested repair bills and, therefore, make satisfied customers, but it has helped the men in the shop.

It has helped them because in most cases where the system is used the dealer has offered a sort of bonus to the men if a job is turned out in less than the specified time. In one or two instances we know of, if a job is done in less than the required time the extra time is credited in dollars and cents to the customer and mechanic.

Some cars are easier to work upon than others, depending on the care which they have received in service and the careful owner, therefore, gets the benefit of the fixed price system, when a mechanic can perform certain operations easier. Of course, if a mechanic slights a job and gets through sooner than he should, he is held responsible for the job if the car owner comes back and complains that the work has not been satisfactorily done. As a rule an inspection by the foreman will tell this.

Headlights

THE headlight which is one of the essential parts of an automobile has been sadly neglected. It is never heard of unless some fatal accident occurs as the result of glare or insufficient illumination of the road. The adjustment and mounting features have been given very little consideration, and as a result many of the cars on the street are being driven with the headlights out of adjustment.

Legislatures have passed measures that compel the owner to have lights adjusted to meet specified standards. The laws in some states will not permit the sale of a car unless some provision is made so that the lights will conform to the standards. The average car owner knows nothing about the adjustment of the lights and therefore it is up to the dealer to furnish the service.

Headlight service if properly handled is just as valuable as any other kind of service, and its success is dependent upon the ability of the mechanic to make the proper adjustment. This will require some study and experimental work because the introduction of many types of lenses exploded the idea of keeping the bulb at the focal center of the lens to get the best lighting conditions.

The legislatures are creating a demand for headlight service and the wide awake dealer that prepares for it will be well repaid.

A Reputation for Fair Dealing

GETTING the public confidence and keeping it form the ground work for the successful selling of used cars. The dealers who have made the greatest success of used car selling are those who told their customers exactly and with strict adherence to facts what they are offering. The public learns to believe in them.

Misrepresentation gains nothing in the end for the buying public soon learns whether or not you are selling according to your preachments. Veneering a job so that it will look like new and encouraging the prospect in the belief that it is as good in its mechanical elements as it appears to be in body may sell that particular car but each sale so made is strengthening sales resistance for you.

A purchaser sooner or later finds out if you have treated him fairly; if the car you sold was what you claimed it to be; if it was worth the price you charged him for it; if you obtained his patronage under false pretenses. A disgruntled customer is a great liability. He will not come back to you when he wants to buy another car or when he wants service and the likelihood is that none of his friends will appeal to you when the time comes for them to make a purchase.

You can build up your business by your used car sales for every man to whom you sell a used car is a potential purchaser of a new car. Sometime or other he will be in the field for a car fresh from the factory and with your reputation for fairness established it is fair to assume he will come to you at that time.

The association with the public is so close that no unit of the industry can afford to be an alienating factor.

ARE you selling accessories that require a rather intricate installation? If so, make the installation right. The accessory is right, or the manufacturer would not think of putting it out on the market, so if there is a come-back after it has been sold, look over the installation. A dealer who was handling a well-known accessory, and selling a great many of them found after a while that the come-back steadily increased to huge proportions. At first though he blamed the manufacturer and later he found that his installations were not as correct as they may have been. A more careful study of each installation and a more careful check on the work after it was done reduced the complaints.

Readjustment Nears Completion

Falling Off in Sales at This Time Not Surprising, Past Reports Indicating That Upward Trend Would Not Remain Unbroken—Peak of Business Yet to Be Reached

By James C. Dalton

NEW YORK, May 12—Temperamental Wall Street is worried again about the automotive industry and is selling motor stocks short. This is its reaction to price cuts, a slight decline in retail sales for April and lower dividend rates. This attitude in the "street" is nothing new and in it there is no new significance.

There is real significance, however, in the remarkable "come-back" of the industry at a time when the entire country is crying depression. This recovery in the middle of a prolonged period of deflation proves that the industry is on a stable foundation. Its future is vastly more assured than that of the railroads whose securities once were the chief source of revenue for widows and orphans.

It was not to be expected that when sales of automobiles began again after the serious slump of last fall and winter they would forge ahead steadily month by month, with each thirty-day period better than the one preceding. That condition never has prevailed in normal times and it never will. Certainly it could not be expected under the abnormal conditions which prevail now.

The automobile business in its very nature has been largely seasonal. This applies to commercial vehicles as much as to passenger cars. Until good roads become universal and until snow removal becomes a science this always will be true.

PASSENGER car sales in all except southern states always increase to a peak in early summer, and there always is a drop in the sales curve about July 1 when the first summer demand has been satisfied. After that sales forge ahead in a satisfying way and business is good in late summer and early autumn, reaching its ebb about the first of the year when winter has taken its firm grip. From this ebb the rise begins gradually and spring sees a sharp up-shoot in the curve.

After its sad lesson with huge inventories purchased at high prices, the automotive industry is proceeding with the utmost caution. It is buying on a hand to mouth basis. This applies to all branches of the industry. Orders are placed only for goods which are actually needed and prompt deliveries are demanded. Sometimes, the parts makers contend, the demands in this direction are unreasonable. They are again beset by stock chasers.

PRODUCTION FOLLOWS DEMAND

Production schedules for automobile factories are based largely on the business done the previous month. Under the conditions which prevail at present, if the sales for April fell below the mark expected, the schedule for May will be cut. Factories now are making only enough cars to meet actual demands.

The fundamental soundness of the industry has not been affected however. The industry daily finds itself more solid than it has been for months and much of this solidity is due to the fact that nearly every condition that arose within the last year had been forseen and the leaders of the industry are still far in advance of the present situation.

A falling off in sales at this time has been expected. Nobody has been caught napping. In fact, MOTOR AGE, Motor World and Automotive Industries, which has chronicled in advance most of the moves and trends of the past year, has had in its office for some time a report from the national sales field, indicating that the encouraging upward swing of sales in the spring would not continue unbroken.

It has been known for months that a price situation was inevitable about this time. When prices broke last fall the industry adopted a stabilizing policy of making immediately any changes that were to be made. Numerous prices were adjusted and those that were not changed were guaranteed until about this time. That stabilization helped materially during the winter months.

Now the next step in the readjustment has been reached and what is needed is stabilization as quickly as possible. Those who are going to adjust should do their adjusting early and help set the stage for a continuation of selling. Until the adjustment is made sales will be more difficult, for the public will not buy on a continuously falling market. Those who are not going to cut should say so and the rest should change their prices and have it over with.

WAITING FOR STABLE PRICES

Reports from the entire country say that buyers are ready to hold off until prices seem stable and there is a feeling that there will be good business in the last half of the summer and during the fall if the stabilization can be effected quickly. Sales of the entire industry will be affected if the companies adjust one by one for the rest of the summer.

Price must be taken into consideration in the present situation. Cars which show value for the money are having good sales—and have had. Some cars may be comparatively over-priced and it is not a perhaps remote possibility that the 1921-22-23 profits of some companies for the term of years might be greater if adjustment to conditions were placed first and full profits second for the remainder of the present year. A healthful readjustment to a basis that would require little change for months to come would be beneficial. *Keen students believe the peak of sales in the industry has not been reached and that the next few years will be the greatest ever seen in motor vehicle sales.*

INTENSIVE SELLING NEEDED

Reports gathered from the national field show instances of dealers who are getting more business than might be expected because of more intensive sales work. One dealer is holding his volume to normal but is using three times the usual number of salesmen to do it. Another dealer is taking cars in the rough and producing what is practically special models in color, and he makes the point that, no matter what happens, the dealer who works will still get some business.

Most interesting in considering the future is the statement by one student of affairs that when the world gets back to working and buying we shall have a new crop of buyers. New conditions will bring a group of new car purchasers and the demand will assume a most healthful character. These new buyers are largely those with whom the desire to own a new car has been keen during the months when conditions prevented the purchase.

Of course, conditions in the automotive field will never return to absolute normal until all other fields have done the same thing. There will, however, be business. Conditions will be more generally enjoyable if each factor in the industry will decide where it is going to sit and let the show go on to the best of its ability.

Industry in California Is Winner in Legislative Test

Most Destructive and Restrictive Laws Ever Proposed in State Are Defeated

LOS ANGELES, May 13—The motor vehicle industry of California has emerged from the 1921 session of the state legislature victorious after having to battle against the most destructive and restrictive legislation ever proposed in this state. On the one side were arrayed the motor car dealers, the automobile clubs, and the motor draymen, and against them were the state's highway commission, the motor vehicle department and the county supervisors. After a struggle of four months the concrete result was the passage of an amendment to the existing vehicle act of 1919 which specifies the weight of any four-wheel vehicle must not exceed 30,000 pounds or of any six-wheel vehicle 40,000 pounds, and the weight on solid-rubber tires must not exceed 700 pounds per inch channel base measurement.

As the result of conferences held in various parts of the state beginning last November, there was prepared what was known as the Lee bill. This revised the Act of 1919 in many details, specified that the gross maximum weight should not exceed 26,000 pounds, that county supervisors could reduce this on county roads to not less than 22,000 pounds and set up a new speed schedule for trucks.

The bill passed the assembly but was killed in the senate committee on roads and highways. The senate committee thereupon presented an amended measure known as the Morris bill, the amendment providing a special fee on all passenger cars and trucks in addition to the horsepower fee, set the maximum gross weight at 26,500 pounds and reduced truck speeds. Opposition developed to the bill, because the state will have available for road improvement in the next four years $57,000,000 and on the ground that the additional fees are unnecessary. The truck opposition was based on the reduced weight allowance and higher fees. The bill went down to defeat in the assembly on the last day of the session.

Goux Selected by Ballot to Drive at French Grand Prix

BY W. F. BRADLEY

European Correspondent of Motor Age

Paris, May 1—Jules Goux will be at the wheel of an eight-in-line Ballot in the French Grand Prix race on July 25, according to an announcement just made by Ernest Ballot. This appointment has caused considerable surprise, for Goux has been connected all his life with the Peugeot Co. and has never driven any other make of car. At the present time he is chief of the dormant Peugeot racing team, is a Peugeot dealer with showrooms in the Champs-Elysees, Paris, and all the members of his family are more or less linked up with the Peugeot organization. It was Goux who overlooked the construction and the preparation of the two Peugeots just sent to America to run in the Indianapolis race.

It is probable that Ballot has selected Goux in reply to the temporary transfer of his driver Chassagne for the Indianapolis race. It having been decided that no Ballot car would be sent from France this year for the Indianapolis event, Chassagne asked permission to drive any other make of car in this event, and succeeded in getting the Peugeot company to build him a car. Chassagne sailed a few days ago taking his Peugeot racer and the second car for Wilcox with him, and also carrying as personal baggage a new engine to be fitted in Ralph De Palma's Ballot racer.

The Ballot racing team for the French Grand Prix is now Ralph De Palma, Jean Chassagne, and Jules Goux, with a fourth man to be appointed.

Trainload of Fords to Mexico; Demand for Used Cars Is Great

Laredo, Texas, May 12—There has passed through Laredo a solid trainload of Ford automobiles. The shipment came direct from the Ford factory in Detroit and is consigned to Ford dealers at various points in Mexico. The cars were crossed into Mexico at this point without delay, and, notwithstanding the motive power shortage in that country, the train was sent south as soon as it reached the other side of the border. It is stated that this is the first of several similar shipments that are to be made soon. Many used cars are also being shipped to Mexico. Dealers in Laredo, San Antonio, Eagle Pass, El Paso and other towns on and near the border are flooded with orders for used cars from Mexico, it is stated.

WILMINGTON CHOOSES OFFICERS

Wilmington, Del., May 13—The Wilmington Automobile Trade Association has elected the following officers for the ensuing year: President, Harry R. Loose; vice-president, F. O. Taylor; secretary, Clarence Unger; treasurer, E. F. Merritt; board of governors, Edward Smith, Jr., E. C. Ulrich, Henry A. White, Enoch Moore and Coleman Johnson. At the annual meeting, which was held at the Hotel DuPont, local trade conditions were reviewed. While general business conditions here are at a low ebb, there is an indication of early improvement. Selling has been fairly good, considering everything, and there is reason to believe that there will be a good demand for cars, passenger and commercial, all summer.

SPEEDWAY FOR SANTA ROSA

Santa Rosa, Cal., May 13—The $250,000 motor speedway for this city is assured. The site has been selected and the plans have been accepted. The board course is to be a mile and a quarter. Jack Prince the designer, who also designed the Los Angeles speedway, says that it will be a 120 miles per hour course.

Tire Dealers to Ask Makers for Chance to Buy Seconds

Conference Between National Association and Manufacturing Bodies to Consider Proposition

CLEVELAND, May 13—A movement has been started here by the executive committee of the National Tire Dealers' Association which has headquarters in this city to have tire manufacturers give the bona fide retailer an opportunity to purchase the seconds that come from the factory.

Dealers have complained that unfair competition results from the fact that a few agencies in the country purchase in large quantities all second tires. They sell them by mail and put on special sales, retailing the seconds at low prices without telling the consumer that the tires are second grade. With this business in the hands of regular dealers who are bound by ethical business standards maintained by organizations they are affiliated with, both the dealer and the consumer would profit.

The association proposes that every dealer be given the privilege of buying second tires to the extent of 5 per cent of his order for first grade products. It is argued that this will protect the manufacturer and enable him to sell his first grade tires, as well as to dispose of his seconds.

Thomas F. Whitehead, president; R. J. Walters, member of the board of directors and Philip O. Deitsch, secretary of the association, are leading in the movement. A committee of seven members of the Rubber Association of America, seven of the Midwest Rubber Association and seven of the National Tire Dealers' Association will meet shortly to consider the proposal. The tire dealers' association, although it was organized but three months ago, now has 22 branch organizations affiliated with it and 12 others in process of being formed. Members number 5,000 dealers. The annual convention will be held in this city early in November.

DEALERS TO MEET AFTER RACE

Indianapolis, May 13—Officials of the Nordyke-Marmon Co. here are planning to inject more "pep" into the Marmon dealers at a dealers' meeting to be held the two days immediately following the 500-mile race. A. J. Rogers of the company, who is making arrangements for the meeting, said he expected about 200 dealers present. The meeting will go into an analysis of merchandising problems and sales plans worked out by the company for the coming year will be gone into and explained. Half of the time will be open to a general discussion by dealers of the problems and pitfalls of the coming year and the opportunities of the coming year as well. The company has virtually perfected its advertising plans for the year as well as its sales plans and speakers from the company will tell why these plans should be followed.

Dealers Are Recognized as Integral Part of Industry

Manufacturers Evidence Desire to Co-operate with Them in Solving Their Problems

DETROIT, May 16—An epoch has been marked in the history of the automobile dealer in the fact that for the first time in the history of the industry he has come to be recognized as an integral part by the manufacturer and with all differences rapidly being ironed out an era of co-operation and concerted effort for mutual development has dawned in the opinion of N. A. D. A. leaders who attended the conference between representatives of their organization and the N. A. C. C.

Representing the National Automobile Chamber of Commerce and speaking directly for that organization five men constituting a committee named by the directors, gathered about a table in the Detroit Athletic Club and for eight hours gave willing and patient attention to the requests of the dealers seeking modifications of many of the ruling that have been characterized as arbitrary and unjust. The attitude with which every suggestion was received is said to have indicated a desire on the part of the manufacturers to lend every effort in bringing about the harmonious relations so necessary to the success of dealer and manufacturer.

Committees Will Meet Regular

The apparent evidence of full understanding of each others problems and the avowed desire to join hands in the promotion of mutual interests assures future efforts on a fifty-fifty basis with the ogre of mistrust and suspicion removed. Evidence of this is shown in the plan for future meetings between committees from the N. A. C. C. and the N. A. D. A. which will be held at regular intervals and at which all matters arising in connection with the manufacture and merchandising of automotive products will be disposed of.

A great part of the session was consumed in discussion of cancellation clauses in dealer contracts, and while no information was given out as to the requests made by the dealers, it can be said they were received without serious objection and in a spirit that gives hope of favorable action by the manufacturers.

The used car problem—the big factor now confronting the industry—naturally proved one of the big issues at the conferences, but lengthy discussion participated in by all present brought no concrete suggestion of a solution.

Three of the suggestions planned for discussion, discounts, exclusive representation and freight rates, were eliminated, the dealers themselves being unable to agree as to discounts. Aside from the contracts and used cars, the question of parts, stocks, advertising and service took up the time of the conference. At its conclusion the following formal statement was given out by Manager Reeves on behalf of both committees.

"With a view to further co-operation in solving present problems in the automobile industry, representatives of the National Automobile Chamber of Commerce and the National Dealers' Association held an all day session at the Detroit Athletic Club today and considered such items as yearly contracts, used cars, parts, stocks, and service to the public.

"Contracts were considered from the view point of clauses that would strengthen the dealer with his banker and his customer. On the problem of used cars it was agreed that a general investigation should be made into the used car situation by the national organizations.

"Sectional advertising for the benefit of the dealers, a closer and more frequent survey of parts, stocks and a broadening of service plans for all users of cars and trucks were deemed necessary for the dealers' success.

"Today's suggestions with additional information to be obtained, after consideration by manufacturers and dealers, will be the subject of another meeting of the committees to be held in Detroit next month."

License Tax Senseless, Says New York Times

THE following is an extract from a leading editorial in the New York Times:

Not only is the Government's total yearly bill of $4,000,000,000 shocking, but the method by which it attempts to raise the money to meet that charge is likewise shocking. * * *

A part of the "nuisance taxes" Mr. Mellon would repeal; others like the transportation tax, and the tax on admissions he would retain. But they are nuisances just as much as the tax on fountain drinks and others levied under Section 904 of the Revenue act. He would increase stamp taxes and, strangely enough, proposes a "license tax on the use of automobiles." The automobile is no longer a vehicle of pleasure. It is a common conveyance, necessary to the business man, the professional man and the farmer. Such a tax would be as senseless as one levied upon a farmer's horse and wagon or upon his oxen and cart. Why is it necessary to beat about the bush to bring in these new sources of revenue or to retain others proved to be objectionable?

HAYNES NOT TO REDUCE

Kokomo, Ind., May 13—Alton G. Seiberling, vice president and general manager of the Haynes Automobile Co., announces that the prices of Haynes cars will not be reduced after the expiration of the present Haynes customer price guarantee on July 1, 1921.

Parts Makers and Dealers Join in Series of Service Lectures

First Demonstration Talk Will Be Given in Detroit—Schedule Outlined

DETROIT, May 13—Demonstration lectures to service managers, mechanics and others concerned in the repair and servicing of automobiles and trucks will be given in various cities beginning May 17 with a lecture at the Cadillac service station here under the auspices of the Detroit Auto Dealers' Association. The lectures have been arranged through the efforts of Harry G. Moock, manager of the N. A. D. A. and officials of Continental Motors Corp., Timken-Detroit Axle Co., and Borg & Beck. An expert from each of these companies will lecture on proper servicing of those parts and will give demonstrations in repair work.

Experts employed by other manufacturers of standard units will be added as rapidly as is possible and it is hoped to extend the work to cover every large distributing center in the country. In each case the local dealers' association will have charge of arrangements for the lectures, bearing the necessary expense and attending to the work of bringing out a full attendance of those sought to be reached.

Two nights will be devoted to each city and the itinerary of the lecturers following the Detroit meeting will be Cincinnati May 19 and 20, Indianapolis May 23-24, St. Louis May 31-June 1, Kansas City June 3-4, Omaha June 6-7, Chicago June 9-10-11 and Milwaukee June 13-14. A change in the schedule to include Minneapolis is probable.

There will be no sales or advertising propaganda used in connection with the lectures, the idea being primarily to educate the greatest possible number of those concerned with servicing for the general good of the industry. The companies sending out experts will bear all expenses in that connection. The movement is the opening wedge in the free educational movement planned by the N. A. D. A. and which is expected eventually to develop into a motor vehicle chautauqua. Timken will send H. E. Rotert, sales engineer; Continental will have Paul Lund, of the engineering department and C. M. Ahline will demonstrate proper servicing of Borg & Beck clutches. There will be no charge for attendance, the only requirement being the signing of cards so that employers may be made cognizant of the efforts of their employes to add to their knowledge and fitness.

NEW A. E. A. CONVENTION DATES

Chicago, May 12—The date of the convention of the Automotive Equipment Association, at Mackinac Island, has been changed from the week beginning June 20 to the week beginning July 4. Hotel arrangements were responsible for the change.

Motor and Accessory Makers See Onward March of Industry

Better Feeling Among Members at Five Group Meetings Throughout Country

NEW YORK, May 13—A month's sustained and unbroken progress in the onward march of the automotive industry is reflected in the May analysis of conditions of the Motor & Accessory Manufacturers' Association.

"The gratifying betterment of fundamental factors noted in last month's survey is increasingly manifest in the first-hand reports and authoritative financial data consolidated in the summary for the month of April," comments M. L. Heminway, general manager of the association.

"Payments for the last month have been better than for the three months prior," says the report.

"More firms are paying their current accounts in full on due date, and an increasing number are paying a larger proportion of their notes as they fall due, quite a number paying in full.

"Releases on old orders show a decided improvement. Many of the car and truck manufacturers are placing orders for new materials. Virtually all the car manufacturers are now showing signs of life, and this applies to the manufacturers of trucks and tractors to a somewhat lesser degree.

Labor Conditions Improving

"Quite a number of vehicle manufacturers are operating their plants at full time or nearly so.

"Labor conditions in the automotive industry seem to be causing comparatively little trouble. There is a marked increase in labor efficiency following the readjustment period."

These statements loom up conspicuously in the chart of automotive trends plotted with the greatest possible precision by the credit and financial executives of the principal manufacturers making parts, units and accessories for the passenger car and truck builders. Close to 400 of these parts-purveyors are affiliated with the Motor & Accessory Manufacturers' Association.

Through monthly group meetings for the interchange of credit information and the pooling of experiences and viewpoints, these unit and equipment makers are able to diagnose conditions in an impartial and scientific manner. No attempt is made to cloak unpleasant facts. The parts makers must face the conditions as they are. Their verdict is therefore based on evidence, not on expectation.

During the last week in April, five groups of the Motor & Accessory Manufacturers' Association met to discuss business and financial conditions generally and the credit entitlements of the makers of motor vehicles. One group met in New York City, the others in Chicago, Detroit and Cleveland.

The information on business conditions brought out in the five groups showed little variation. Without exception, every significant indication was constructive. Some members, to be sure, insisted that the present improvement in business is only a spurt which will be followed by a decided slump after July 1. This, however, was distinctly a minority report, in no way sustained by the preponderant weight of the evidence. The majority opinion seems to be that the improvement has been so gradual and consistent that it presages a continued increase of business along conservative lines.

Collections and Credits Easier

"Altogether," says the report, in recapitulation," there is a decidedly better feeling among our members. Collections are better and money required from banks seems to be somewhat easier. Many plants are resuming operations on a larger scale than heretofore, and the condition of extreme depression has certainly changed for the better."

Makers of automotive accessories and the smaller replacement parts report an unusually large volume of business from dealers and jobbers.

A first-hand up-to-the-minute report on automotive business conditions on the Pacific coast was telegraphed to the association's headquarters by Ezra W. Clark, advertising manager of the Clark Equipment Co., Buchanan, Mich., who is making a speaking tour across the continent, addressing local dealers' organizations and Chambers of Commerce. He is also placing on exhibition his oil paintings on "The Spirit of Transportation" by 12 of the leading artists of America who portrayed on canvas their "conceptions of the dynamic force of civilization—transportation."

"Business conditions on the Pacific coast show decided improvement," telegraphed Clark.

Dealers are Co-Operating

"New registrations are greater than last year, showing more sales. Dealers' associations strength in adversity has shown need of solidarity and co-operation. Organizations are putting on real sales pressure.

"San Francisco is now holding a wonderful open road week. Present stocks of cars will be exhausted in two weeks.

"Many better known cars are now unable to make floor deliveries.

Due to prohibition California has received splendid price for grape crop, many new vineyards being planted.

"Good demand for heavy trucks for highway construction and light trucks for agricultural use."

MOON SALES SHOW BIG INCREASE

St. Louis, May 13—Sales of the Moon Motor Car Co. are greater than at any time in the history of the company, according to figures compiled by President Stewart McDonald which show that the company's domestic business for the first four months of this year is 27 per cent ahead of that for the corresponding period a year ago.

United Motors Service Plans to Reach Smaller Communities

Extension Arrangements Discussed at Three Days' Convention of New York Distributors

NEW YORK, May 13—Plans of United Motors Service, Inc., for the extension of replacement parts service direct to consumers through dealers and garagemen throughout the country were discussed at a three-day convention of New York branch territory distributors here this week.

The meeting is one of a series of eighteen that are being held to introduce the new plan to men who service Delco ignition, Remy carbureters, Klaxon horns, Harrison radiators, Jaxon rims and other United States Motors Service products.

In introducing the plan Fred A. Oberheu, salesmanager, asked the distributors to assist in the extension of the service in their respective territories through selling small dealers and garagemen United Motors Service contracts. He pointed out that the prime object of the extension of the sales plan at this time was to make it possible for every motor car owner to get service and genuine replacement parts for any of the company's products through the establishment of selling and servicing connections in the smaller communities. Oberheu also explained the national advertising campaign through trade publications, nationally circulated periodicals and the newspapers which is to support the extension plan with an educational program stressing the use of genuine parts, and enlarging on the fact that material and workmanship, rather than dimensions, are the factors to be considered in the satisfactory replacement of parts in these products.

The convention, which opened Monday, followed an interesting program of sales and service topics which were discussed by Oberheu, D. M. Sweeney, superintendent of distribution; J. W. Parry, manager of the technical department, and R. L. Stevens, of the technical department.

A HOAX IN INDIANA

Indianapolis, May 13—Dealers in Indiana are being warned against a new kind of automobile crook. The newest method of getting money under false pretenses is about as follows: A man arrives in the smaller town and registers at the hotel, giving out the information in a careless manner that he is a factory representative of one of the larger automobile companies and is in the city signing up men to drive cars to Los Angeles or other distant points. Employees around the various salesrooms and garages are taken off their feet by the prospect of such a trip and finally they are on "borrowing terms" with the "factory representative" until his check comes in. Suddenly the man leaves the town and the subsequent telegram to the factory discloses the hoax.

More Service Station Work Because of Used Car Sales

Employment in Milwaukee on Increase Due to Necessities of Present Situation

MILWAUKEE, May 16—It has been especially gratifying to commercial, industrial and civic organizations of Milwaukee to be informed by governmental sources that one of the reasons that Milwaukee is one of the few large cities of the country showing an increase in number of men employed is the steady expansion of production in the automotive industries.

This increase is being accentuated day by day by the re-employment of men who were laid off months ago, as well as the extension of working schedules of men who were retained at reduced hours. Motor manufacturers specializing in passenger car power units are now operating at capacity, with several reporting overtime schedules in some departments. Makers of heavy duty motors for trucks and tractors are doing better, especially the former.

Employment in service and repair shops continues to increase, due to the necessities of a situation in which used cars taken in trade are more numerous than ever before and buyers of renewed cars insist that the mechanical condition must be first class. Many owners who withheld overhauling during the winter months because of financial or other reasons are now putting their cars into shops. Sometimes the delay was contingent upon a decision to buy a new car this spring, or a desire to resell a car privately to convert it into ready money, the amount of which is determined largely by the condition of the vehicle.

Repair shops as a rule are very busy and employing more men. Wages have been reduced, especially when men are re-employed. Pay depends almost entirely upon recognized ability and is less uniform as to scale than in a number of years, as it ranges from 50 cents an hour for helpers to $1.10 an hour for skilled workers.

Pratt Manager of Accessory Division of General Motors

New York, May 12—General Motors Corp. announces that John L. Pratt has been appointed general manager of the accessory division of the corporation, with headquarters in New York City. He relieves Alfred P. Sloan, Jr., vice president of the corporation, of direct supervision over the activities of the accessory units as follows:

Hyatt Roller Bearing	New Departure Mfg.
Remy Electric	United Motors Service
Jaxon Steel Products	Delco Light
Dayton Engineering Laboratories	Klaxon
Harrison Radiator	Champion Ignition
Lancaster Steel Products	Frigidaire
	Dayton Wright

Pratt was formerly special assistant to the president of the corporation and chairman of both the inventories committee and the appropriations committee. Prior to coming with General Motors he was director of the Motors development division of the duPont Co. His position now is similar to that held by Sloan under the Durant regime.

E. F. Johnson has been appointed general manager of the intercompany parts division of the corporation, with headquarters at Detroit. Mr. Johnson assumes direct supervision over the activities of the inter-company units as follows:

Saginaw Parts	Canadian Products
Saginaw Malleable Iron	Northway Motor
	Central Forge
Central Foundry	Central Axle
Michigan Crankshaft	Lansing Axle
Central Gear	Muncie Parts
Saginaw Products	Muncie Products

DEALERS BACK OWNERS' CLUB

Atlanta, May 12—The Atlanta Automobile Dealers' Association may father the organization here of an Atlanta Automobile Club, as the result of a plan offered at a recent meeting by A. L. Belle Isle, a prominent Ford dealer, who pointed out that such clubs are flourishing in several cities and have proven a boon to automobile dealers. The membership of the club would include automobile owners only. Members of the association approved the suggestion and definite steps will be taken in the near future looking toward the organization of such a club.

TEXAS CITIES HOLD SHOW

Dallas, May 12—The idea of automobiles shows for stimulating business has spread to the smaller towns of Texas. This week Paris and Corsicana, of 15,000 to 17,000 population, staged shows with every dealer in the two cities getting in back of them. Along with the cars were exhibited tires, trailers and accessories. In both of the cities elaborate style shows were held at the same time.

Senator Says Anti-Dumping Bill Will Protect Industry

In Meantime Import Organization to Sell Equipment Is Formed in New York

WASHINGTON, May 13—Senator Ball of Delaware informed MOTOR AGE yesterday that the anti-dumping bill which passed the Senate this week, authorizing the Secretary of the Treasury to levy customs duties in cases where an investigation disclosed unfair competition, would protect American dealers against reimportation of surplus war supplies sold abroad by the Federal government. The automotive industry had hoped that a clause would be inserted in the bill covering this subject specifically as European speculators contemplate throwing enormous quantities of motor vehicles and equipment on the American market.

Because of drastic changes made in the Senate in the anti-dumping bill it is expected a bitter fight will follow when it goes to conference in the House. This may result in a disagreement and throw the bill back for passage through both houses.

Formation in New York of an import organization which proposes to sell $3,000,000 worth of automobile equipment purchased from the Slough Trading Co. of England is expected to stir automobile manufacturers and dealers to such an extent that they will attempt to convince Secretary of the Treasury Mellon that an inquiry into this competition is essential for the protection of the American industry. The finding of investigators would determine the amount of duty which Mellon could levy to equalize domestic prices and quotations for reimported vehicles.

Outstanding Automobile Facts of 1920

Volume of Motor Vehicle, Parts, Tires and Accessories Wholesale Business	**$3,594,814,620**
Value complete car and truck output	**2,232,927,678**
Value parts and accessories output	**725,136,942**
Value tire replacement output	**636,750,000**
MOTOR VEHICLES PRODUCED	**2,205,197**
Number cars	**1,883,158**
Number trucks	**322,039**
Percent gain over	**12**
Per cent exported	**7½**
REGISTRATION IN U. S.	**9,211,295**
Per cent gain over 1919	**22**
Number automobiles on farms, approx.	**3,000,000**
MOTOR VEHICLE MFG. BUSINESS:	
Capital invested	**$1,204,378,642**
Number of employes	**325,000**
Wages and salaries	**$ 482,950,000**
TIRE AND FUEL FIGURES:	
Gasoline, gallons produced	**4,882,546,699**
Gasoline, gallons consumed	**4,256,428,005**
Tires produced	**32,400,000**

Maxwell Motor Corp. Obtains Charter; $40,000,000 Capital

Chalmers Assets Taken Over, Although Name Does Not Appear in Corporate Title

NEW YORK, May 13—The Maxwell Motor Corp., capitalized at $40,000,000, has been incorporated under the laws of West Virginia to take over the assets of the Maxwell Motor Co., Inc., and Chalmers Motor Co. The company is authorized to manufacture and construct automobiles, motors, engines, etc., and do all things incident to the business of building motor cars.

Formation of the new corporation is one of the first steps in the reorganization and consolidation of the Maxwell and Chalmers interests. It had been supposed that the Chalmers name would be retained in the corporate title of the new company but it apparently has been lost although manufacture of the car will be continued. The physical assets of the Maxwell company in Detroit will be bid in this week at a receiver's sale by the reorganization committee headed by Walter P. Chrysler. No other bids are expected. When the process of acquiring the assets of the two companies is completed they will be assigned to the West Virginia corporation.

Will Elect Directors and Officers

The incorporators of the new company are clerks in the law offices of Albert Rathbone, the attorney who represents the reorganization committee. Directors and other officers will be elected as soon as the reorganization is complete and the board will include representatives of both the Maxwell and Chalmers companies.

The stock of the Maxwell Motors Corp. is divided into 200,000 shares which have a par value of $100 each and 800,000 which have a total value of $20,000,000. The charter was the first large one issued in West Virginia since the enactment of the non-par stock law. The company is the second largest ever granted a charter by the secretary of the state of West Virginia.

Detroit, May 13—United States District Judge Arthur J. Tuttle has denied a petition of first preferred stockholders of the Maxwell Motor Co. in which the petitioners asked to intervene in the sale of the company.

The petitioners asked to intervene on the grounds that the proposed merger of the Maxwell and Chalmers Motor companies would take away their holdings and give them only a small share of the stock of the new company. The court ruled that such a step would prevent reorganization of the company and thereby endanger the future of the concern. Attorneys for the reorganization interests argued that the reorganization plan was fair, giving all classes of shareholders representation in the new company and making it possible to procure funds with which to liquidate the more than $15,000,000 indebtedness of the concern and to continue in business.

The petition of Holmes Jones of Wilmington, Del., asking a stay in the sale pending settlement of litigation in Delaware courts, was dismissed by Judge Tuttle on the grounds that it contained improper statements.

Attorneys for the first preferred stockholders obtained permission from Judge Tuttle to file a new petition for intervention at the time of the court's confirmation of this week's sale.

The court some time ago appointed a receiver for the company and provided for the sale.

Bankruptcy Would Ruin Company

Judge Tuttle held the concern must have new money in order to save that already invested. He said bankruptcy would ruin the company and declared to stop the sale would likely kill the whole undertaking. Appointment of a permanent receiver, he said, would be a detriment to shareholders in that it would interfere with sales, for no man would buy a car from a concern in receivership. "He thinks more of service than he does of the make," said Judge Tuttle.

Detroit, May 13—Sale of the Maxwell Motor Co. by auction, as ordered by United States Judge Arthur J. Tuttle to provide for the reorganization of the company with the Chalmers Motor Co., has been consummated. The property was acquired by Walter P. Chrysler of New York, chairman of the reorganization committee of the two concerns, and Harry Bronner of New York, a member of the committee. The sale price was $10,915,100. Judge Tuttle has stipulated the property must not be sold for less than $10,000,000.

GASOLINE PRICES LOWER

New York, May 12—The average price of gasoline in 30 large cities of the country is now 23.4 cents a gallon wholesale compared with 29.3 cents at the beginning of the year, a decline of 5.9 or 21 per cent. The sharpest declines have been in cities of the mid-continent district. The price in Dallas, Texas, has dropped from 31 cents to 19 cents since Jan. 1. The second largest declines was a drop of 11 cents in Tulsa, Oklahoma. Houston, Texas, shows a drop of 10 cents a gallon and Kansas City 9.5 cents a gallon.

SOUTH CAROLINA MEET IN JULY

Columbia, S. C., May 12—The South Carolina Automotive Trades Association will hold its semi-annual meeting at Greenville, July 20. Officers at headquarters here are working on the program and every effort will be made to make this the most notable meeting in the history of the association. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, will be the principal speaker at the meeting.

Three Foreign Drivers Arrive; Hill and Thomas in Race List

Thomas, Boillot and Chassagne with Coatalen Reach New York on Way to Indianapolis

NEW YORK, May 12—The three European race drivers who are to compete in the Indianapolis 500-mile speedway race on Monday, May 30, arrived this week and their cars are already at Indianapolis. Rene Thomas, who won on a Delage in 1914, is one of the three, and will drive one of the new eight-cylinder Sunbeams in which the eight cylinders are in line. This will be his fourth appearance at Indianapolis. Andre Boillot, who will drive a Talbot-Darracq, was a traveling companion with Thomas on the Olympic and they are teammates at Indianapolis. The Talbot-Darracq is very similar in design to the Sunbeam, having eight cylinders in line.

The third European driver to arrive is Gene Chassagne, who will be a driving partner with Howard Wilcox, piloting Peugeot cars. These cars are practically the same as manufactured by the Peugeot company and raced at Indianapolis last year. Last year five valves per cylinder were used but they did not prove satisfactory and only four per cylinder are used in this year's cars.

The second Sunbeam will be driven at Indianapolis by Dario Resta.

The other European car to be represented at Indianapolis is the Ballot, to be driven by Ralph DePalma. This is an eight-cylinder in line design and is practically the same car as raced last year with the exception of a new engine.

In the Sunbeam and Talbot-Darracq cars the engine, gearbox, etc., are placed 8 in. to the left of the center line of the chassis following practice used last year on the Duesenberg and Chevrolet cars. This is intended to relieve the outer right tires of load and increase their racing life.

Indianapolis, May 13—Late changes in the list of drivers at the international 500-mile race to be held here May 30 substitute the name of Bennie Hill for that of John A. Thiele as driver of one of the Duesenberg Specials. Thiele, who has entered the car, will go as mechanician. Joe Thomas will drive one of the Junior Specials entered by C. L. Richards.

A number of the drivers and their cars have already arrived at the speedway and tests are being made. The Duesenbergs are here but have not yet taken to the track. DePalma, with his nephew-mechanician, Peter De Paolo, has tried out the course in his French Ballot. Bennie Hill and his Duesenberg and Brett with one of the Junior Specials, have been out on the track, and Joe Thomas, who is getting acquainted with the second Junior job, will probably take the course early.

French Industry in Defense of Return of American Products

Wish Expressed That All Automotive Equipment Will be Shipped Back Here

BY W. F. BRADLEY

European Correspondent of Motor Age

PARIS, May 1—Motor Transport Corps First Reconstruction Park, at Verneuil, the biggest organization of its kind left behind by the American Army in France, has been sold after standing idle for 29 months. This park was built in four months by the Motor Transport Corps, and at the time of the armistice was running with 3,500 soldiers, all of them skilled hands, while 1,500 German prisoners were working on the construction of additional buildings. The total area was 355 acres, and the park was laid out for the complete overaul and reconstruction of motor vehicles of all kinds.

Parts Have Been Ruined

Immense stocks of spare parts were kept at Verneuil, and although the American Army is supposed to have prepared complete inventories, the French authorities never knew how much material was contained in this camp. M. Doucet, who had purchased the park from the French Government at a cost of 55,000,000 francs, admitted in an interview with MOTOR AGE representative that he did not know how much material he had bought. The only definite information obtainable at the offices of the company was that there were 9,000 unopened boxes of Ford parts. A representative of the Ford company in France, who had an opportunity of opening some of these boxes, stated that most of the parts were ruined by being left out in the open. On this account his company refused to purchase.

The biggest stocks of parts, according to the officials of the purchasing company, are for the following cars and trucks: Cadillac, Cole, Dodge, Ford, F.W.D., Garford, G.M.C., Kelly, Mack, Nash Quad, National, Packard, Peerless, Pierce-Arrow, Riker, U.S.A., White, Holt Tractor and Harley Davidson and Indian motorcycles. There are very few complete vehicles, for Verneuil only existed for a reconstruction and supply. The park, however, had machine shops of such a complete nature that it would have been possible to build automobiles in them. All this machinery is now for sale, and the Austin buildings will also be disposed of.

Sale Has Been Made Outright

The park contained 45,000 solid tires and about 60,000 pneumatics when taken over by the French Government. Most of the pneumatics were used by the French army or sold privately, but the solids remain, and are to be thrown on the market, after having stood in the open for more than two years.

It doubtless will be a difficult matter to dispose of all these spare parts in European countries, for the stocks are out of proportion to the number of vehicles in service here. The purchasers declare that it is their intention to sell in big lots, as far as possible, and to dispose of this material in America if purchasers can be found. It is thought that these supplies will interest American jobbers, manufacturers, of big truckers. A thoroughly commercial sales organization is being gotten together, but Verneuil being in a rather inaccessible part of France it will be difficult to get purchasers to the camp for small lots.

Protests Against Return of Goods

Although sale has been made outright from the French Government to a private concern, the state retains an interest in the operation, and beyond a certain figure will get a proportion of the receipts.

French opinion fails to understand why America should protest against the shipment of American army automobiles, trucks and parts to the United States. One leader of the French industry declared a few days ago: "We were obliged to take 80,000 American automobiles after the armistice, and after the thousands we had purchased for our own army from the States, it was insisted that we continue to take delivery of automobiles months after the end of the war. The price of these stocks war fixed in dollars at a time when the dollar was only worth 8 francs, and we are now having to pay at the rate of 14 francs to the dollar—and despite all this the American automobile industry protests because a few thousands of her own vehicles are likely to be thrown on her market. America seems to look on the return of these vehicles as unfair competition forgetting that in the first place she forced us to absorb immense stocks for which we had no need, thus flooding our market and contributing in a very large degree to the present glut. It is fortunate for us that there was no clause in the agreement against the return of this material to America, and personally I only hope that the whole of the remaining American automobile material will be shipped back to its country of origin."

This opinion was given by a man occupying a high position in the French automobile industry, who requested that his name be not published.

DEFUNCT TIRE COMPANY IN SUIT

Akron, O., May 13—Suit to collect $200,000 alleged to be due on unpaid subscriptions for stock in the Supreme Cord Tire & Rubber Co., of Akron, has been filed in the Summit county common pleas court by Scott Kenfield, receiver of the company. B. L. Eaton, of Greenville, Pa., is sued for $100,000 for stock which he is said to have subscribed for in April, 1920. Eaton was the company's former fiscal agent. The other defendants to Kenfield's action are all directors in the defunct company.

Ford Plans May Production of 100,000 Cars and Trucks

Company Manufacturing Parts in Sufficient Quantities to Insure Supply at All Times

DETROIT, May 13—Production in the Ford plant for May is set at 100,000 cars and trucks, which will establish a record if the company succeeds in reaching the figure set. More than 90,000 cars and trucks were produced during April, which figure is within a few thousand of the highest number ever built before.

Not only did production figures soar during April, but the record for a single day's work since the plant started this year was reached April 25 when 3,857 cars and trucks were produced.

There are today approximately 43,000 men employed at the Highland Park plant and the assembly plants, all but two of which are in operation. These two are expected to open soon. Men have been coming back to work steadily during the last two weeks. The company is manufacturing parts in sufficient quantities to insure Ford owners an adequate supply at all times, permitting them to secure genuine Ford parts quickly. Practically normal conditions are expected to obtain at the Highland Park plant within the next two weeks. Ford sales throughout the country are increasing steadily according to plant executives, and even in the south, where the worst of the depression was felt, there has been a steady upward trend.

Tractor production at the Rouge plant is going up almost daily. April 23, 263 Fordsons were turned out at the Rouge, establishing the high mark for that particular plant. An average daily production of 250 tractors is expected to be maintained right along. During the past two weeks, a large number of Fordsons have been exported to the farming districts in Canada and British Columbia, while the domestic market, officials say, is consuming tractors at a much greater rate than was anticipated.

Another record was shattered by Ford April 22 when blast furnace "A" at the Rouge plant topped the world's mark for daily production of foundry iron with 579 tons 3.15 per cent silican.

PERRIN WITH STEVENS-DURYEA

Chicopee Falls, Mass., May 13—John G. Perrin, designer and builder of the Lozier, has been elected a director and vice-president of Stevens-Duryea, Inc., in charge of engineering and manufacturing. Mr. Perrin previously was vice-president of the Lozier company in charge of engineering and production, later becoming chief engineer for the Timken Detroit Axle Co. and then becoming associated with the Willys-Overland, Ltd., of Toronto. He was first vice-president of the S. A. E. in 1913, director of the Automotive Industries of Canada in 1920 and a member of the Canadian Engineers Standards Council.

Industry Will Urge Early Adoption of Townsend Bill

Also to Recommend Consideration of Tax-Program in Internal Revenue Revision

WASHINGTON, May 13—Representatives of the automotive industry will press Congress this week and next for the adoption of the proposed Townsend highway bill, and recommend consideration of their tax program in the internal revenue revision. An effort will be made to expedite the passage of the highway bill in order that the Senate and House may give full consideration to fiscal legislation and dispose of this all-important matter without much debate.

The American Farm Federation will undoubtedly attempt to block the passage of the highway bill, unless amendments are made covering its demands. However, it is generally understood that with the endorsement of President Harding and large organizations interested in highway development, the measure will pass in the Senate at least within a few weeks. The real opposition will develop in the House, where the organized farmers wield considerable power over certain groups of legislators. Senate leaders have been quick to respond to the President's suggestion that legislation be enacted which would insure permanency in highway construction, rather than numerous highways, which would easily deteriorate. The American Farm Federation is one of the many groups of organized farmers operating legislatively in Washington. It is true that it has a large membership but not sufficient to warrant the assumption by congressmen that the Townsend bill would secure for them the applause of a class of voters. The National Grange, which represents numerous farm organizations of national importance, is advocating the adoption of the Townsend bill without regard to the claims of the rival organizations.

Will Appear Before Committee

George M. Graham, vice-president of the Pierce-Arrow Co., will appear before the Senate committee on postoffice and post roads tomorrow, and will discuss the transportation needs of the present and the future and the requirements of industry and commerce for adequate highways to handle the traffic. Roy Chapin, president of the Hudson Motor Car Co., and chairman of the Highway Committee of the National Automobile Chamber of Commerce, will testify before the same committee next week, his program calling for an explanation of the administrative features of the proposed Townsend bill.

C. C. Hanch, chairman of the taxation committee of the chamber, will appear before the Senate Finance Committee Monday to outline the general tax policy of the national organization. He will be followed by Mr. Graham, who will give the senators specific information as to the discriminatory provisions of the present excise tax. The chamber has announced that it favors a sales tax in place of the excise tax for the additional revenue that is needed. It will also endorse the plan for an import tariff schedule.

The N. A. C. C. is not participating actively in the hearings on the sales tax conducted here this week, but R. A. Brannigan has been present at all the discussions. The sales tax proposal introduced by Senator Smoot appears doomed at this session. A few advocates have appeared as compared with the organizations opposing the plan. Hugh Satterlee of the Manufacturers' Club of Philadelphia stated that the sales tax would be equitable and denied the contention of certain senators that it merely transferred the burden from the wealthy to the poor man.

Ship-by-Truck Bureau Will Aid Anti-Dumping Movement

St. Louis, May 13—Harry G. Moock, general manager of the National Automobile Dealers' Association, has received from Ernest Farr, chief of the Firestone Ship-by-Truck Bureau, the following letter in reference to the reimportation into this country of American made motor vehicle equipment.

"The policy of the Firestone Ship-by-Truck Bureau demands that we lend its influence to all such movements as you portray in the printed matter you have issued relative to the 'Anti-Dumping Resolution.'

"We feel that the present proposed plan of dumping automobiles, trucks, tires and other accessories into this country is working a hardship on all of us. This material was sold some years ago to our government for war use and in turn sold to foreign governments, and just recently resold to American individuals, and syndicates who expect to bring it back to our country for promiscuous sale.

"Believing that this will not only strike a vital blow at the automotive industry, but affect detrimentally all industries, we heartily endorse any plan which will prevent our shores from being made a dumping ground by Europe.

"With this in mind we are asking all of our many employees and agents throughout the country to protest and suggest an anti-dumping resolution such as you outline in your literature on this subject. If the N. A. D. A. can marshal all its forces behind the movement and secure the help of all other national organizations to the same end, it ought to be possible to put through the anti-dumping resolution."

WHIP COMPANY SUSPENDS

Westfield, Mass., May 13—The coming of the automobile has made such serious inroads on the whip industry that the United States Whip Co., the largest factory of its kind in the world, has suspended operations. The company had been operating on a four-day basis.

No Immediate Price Cuts in Products of Willys-Overland

Company Is Pursuing Conservative Sales Policy, President Tells Stockholders at Meeting

TOLEDO, May 13—Reorganization of the executive staff of the Willys-Overland Co. was made complete at the meeting of stockholders held here when the executive committee was increased from five to seven members and the finance committee was eliminated. President John N. Willys addressed the stockholders and promised them that he would devote his entire time to the rehabilitation of the company until it gets back into front rank.

"I shall work harder in the next 12 months than I ever did until I know that Willys-Overland is in its rightful position," he declared. "This institution is my pet and I have just as much faith in it as I ever had. I shall not shirk my responsibility to the stockholders."

Willys told the stockholders that there will be no immediate reduction in the prices of the company's cars notwithstanding many rumors that Overland would join the companies making price cuts.

"We are watching the situation closely and are pursuing a conservative sales policy," he said. "There is a market for the cars at the right value. History of the automobile industry is not over yet. Companies that will survive conditions will be those that have the best management and which have eliminated loose methods. We have cut expenses to the bone. There are many bright spots in the future and we have reason to be hopeful.

"We have $6,700,000 in cash on hand. Agents throughout the nation report increasing inquiries for our cars. Last week showed the biggest increase in retail sales since last September. We are building the best organization we ever had at the Toledo plant. And we will continue on a conservative sales policy. We owe $20,000,000 less than we did a year ago. We have cut our inventories down to $38,000,000."

HOUSTON PLANNING SHOW

Houston, Texas, May 13—Houston is preparing for an automobile style show. Several of the Houston dealers who attended the show at Dallas reported that it not only was a pronounced success but had acted as a great stimulus to business in that section of the state. A committee was named at a recent meeting of the Houston Atuomobile Trades Association to take the matter of holding the show up with various interested parties and report back to the association. Practically every automobile man in the city favors the project and there is little doubt that it will be staged before the summer months pass. Under plans now in mind there will be displays of all kinds of cars and accessories, tires and perhaps trucks and trailers.

Wilmer Succeeds Seiberling as Goodyear Tire President

Stadleman and Litchfield, Vice-Presidents, Only Officers Who Remain Under Reorganization

AKRON, May 13—E. G. Wilmer, brother-in-law of Clarence Dillon of Dillon, Reade & Co. of New York, main bankers in the refinancing of the Goodyear Tire & Rubber Co., will succeed F. A. Seiberling as president of the Goodyear company under the reorganization of the company as necessitated by the refinancing. The only Goodyear officers to remain under the reorganization are Vice-President George M. Stadleman and Vice-President and Factory Manager P. W. Litchfield. Vice-President C. W. Seiberling retires with his brother, F. A. Seiberling. Stadleman and Litchfield remain as Goodyear vice-presidents. H. A. Springford of New York becomes treasurer and Charles A. Stillman, secretary.

The new board of directors will be composed of J. P. Cotton of New York, P. W. Litchfield of Akron, Grayson M. P. Murphy of New York, J. R. Nutt of Cleveland, Robert C. Schaffner of Chicago, A. A. Schlesinger of Milwaukee, G. M. Stadleman of Akron, Ralph Van Vechten of Chicago and E. G. Wilmer of Milwaukee.

A Leading Figure

The reorganization of Goodyear under the $85,000,000 refinancing program means the retirement of F. A. Seiberling, founder and president of the company and recognized as one of the leading figures in the rubber industry of the world. Starting with a $13,500 borrowed capital 23 years ago, Mr. Seiberling founded the Goodyear company which up to the time of its financial predicament was regarded as the largest single rubber company in the world with over 50,000 employees, with over 100 acres of floor space in its Akron factories, a 20,000 rubber plantation in Sumatra, tire factories in Canada and California, a 56-acre cotton plantation in Arizona and fabric mills at Goodyear, Conn., and Los Angeles. The company attained a peak production of over 50,000 automobile, motor truck and motorcycle tires a day and gave the motoring world the pneumatic tire for motor trucks.

The new officers assume charge at once.

Akron, May 12—Stockholders of the Goodyear Tire & Rubber Co. ratified yesterday the $85,000,000 refinancing and reorganization program. More than 90 per cent of the common stock and more than 82 per cent of the preferred stock voted in favor of the execution of a first mortgage on the company's property to secure $30,000,000 in 20 year, 8 per cent first mortgage gold bonds and $30,000,000 in 10 year, first mortgage, 8 per cent gold debentures. Action of the stockholders completes the necessary steps preliminary to definite reorganization of the company.

Columbus, May 12—The reorganized Goodyear Tire & Rubber Co. of Akron today filed articles of incorporation with the Ohio secretary of state.

The articles provide for $140,010,000 of preferred capital stock and 1,500,000 shares of nonpar common stock. In all, there are 2,910,000 shares of both classes of stock. The fee paid the state was $290,010, the largest ever received by Ohio from a corporation for this purpose.

SIEBERLING MAKES STATEMENT

Akron, May 14—"I am going to clear up my personal matters next week and then go away for a month's rest and when I come back I shall go to work at something," Frank A. Seiberling said today. "My brother, C. W. Seiberling, and myself sever all our relations with Goodyear and control of the business passes into the hands of the bankers as provided in the reorganization plan. Both of us continue our interest as the company's largest stockholders. For 22 years we have labored together and what has been achieved the world knows.

"The nation-wide slump in business last fall brought our business to the verge of disaster. Since that hour I have had but one purpose, to save this business from a receivership and this community from the results of such a calamity. That was accomplished yesterday and the new management inherits a business soundly financed.

"My successor, E. G. Wilmer of Milwaukee, is a young man of fine legal training and broad experience in operating business, and with the return of the world to normal business, there is no reason why Goodyear cannot move forward to a higher plane than it has yet achieved. The bankers in control made me an exceedingly generous offer to continue with the business, which, after careful consideration, I felt justified in declining.

"What I am going to do next I do not know. Since I left school 44 years ago I have labored hard, enjoying my work all the way along, through all its difficulties, up to within the period of the last six months. In truth, I have been tired during that period; the burden is now all off my shoulders, except for a few days, I have had no vacation in over two years. I am going away for a month's rest and when I come back I shall go to work—at something."

CALL-OF-ROAD WEEK EXTENDED

San Francisco, May 3—The "Call-of-the-Open-Road" week, celebrated by dealers here, was pronounced a great success and many of the dealers are continuing their displays for the second week. From the standpoint of interest created in motoring and actual sales made, the "Call of the Open Road" celebration rivalled the San Francisco automobile show. Members of the local dealers' association hope to make it an annual affair.

Templar Distributors Vote to Keep Prevailing Prices

President A. R. Erskine Denies Reports of Contemplated Price Reductions of Studebakers

CLEVELAND, May 13—Fifty distributors of Templar Motors Corp., who were here this week for a semi-annual business conference, voted to stand pat on present prices when the question of reducing prices was put up to them to decide.

M. F. Bramley, president of the company, who presided at the conference which lasted three days, announced to the distributors that the factory would renounce its right to determine the price question. He told the distributors that since they were in close touch with the market they alone would be given the opportunity to say whether the price of Templar cars should be reduced now.

Sales conferences which attended the meeting were presided over by Paul E. Ryan, who succeeds Harry Anderson as sales manager.

South Bend, May 12—A. R. Erskine, president of the Studebaker Corp., denied today the reports that a reduction was contemplated in the price of Studebaker cars.

Akron, May 12—The Firestone Tire & Rubber Co. announces reductions of 11½ per cent in prices for cord tires, 16 per cent for fabric tires and 19 per cent for tubes. The Miller Rubber Co. has cut its prices for fabric tires 17½ per cent, for cord tires, 12½ per cent, for all tubes 20 per cent.

Chicopee Falls, N. Y., May 14—The Fisk Rubber Co. has reduced the price of its tires 20 per cent.

Detroit, May 13—Hudson Motor Car Co. and Essex Motors in telegrams to dealers and distributors Wednesday put an end to rumors of a price cut on those cars. The telegram declared that statements indicating the companies were about to reduce prices were without foundation. When prices were reduced from $200 to $450 last fall, the telegram said officials anticipated market changes that since have become effective.

AUTOMOTIVE PRODUCTS IN 1919

Washington, May 12—Official preliminary production statistics compiled by the census bureau show that 312 factories in 1919 produced automobiles worth $1,181,659,000, or more than double the figure shown by the 1914 census when 300 producers manufactured products worth $503,330,137.

Manufactured products worth $567,655,200 were turned out in 1919 by 1,879 manufacturers of bodies and parts. The total value of automotive products in 1919, therefore, was nearly $2,000,000,000,

Concerning Men You Know

H. P. Rhodes, formerly with the Howe Lamp & Mfg. Co., and T. F. McMurray, a former manufacturer in Indianapolis, have organized the "Happy" Rhodes Co., Fort Wayne, to act as manufacturers' sales representatives to jobbers in the middle western states.

O. C. Berry, formerly research engineer with the Hupp Motor Car Corp., has become associated with the Wheele-Schebler Carbureter Co. as chief engineer.

Joseph Talmadge, former sales manager for the Handley-Knight and assistant sales manager of the Willys Overland, Boston, has become wholesale manager for the Oldsmobile Co. of New England.

W. G. Sauer has been appointed to handle the sales and promotion work of the Wolke Lead Batteries Co., Louisville. Elmer Brandell has been placed in charge of advertising.

Henry A. Wagner, formerly general manager and for the past two years in charge of the production and sales of the Reliance Motor Truck Co., Appleton, Wis., has resigned. No announcement is made of his new connection.

Glen B. Hiller, who resigned recently as assistant general manager and director of sales and advertising for the Triangle Motor Truck Co., St. Johns, Mich., has joined the American Motor Truck Co. at Newark, Ohio, as general sales manager.

W. B. Blood, vice president Campbell, Blood & Trump, has been made director of sales and advertising of the Ray Battery Co., Ypsilanti, Mich. Blood will retain his offices with the former concern in an advisory capacity.

O. N. McCool, formerly sales manager of the Commonwealth Motors Co. at Chicago, has become western representative of the Seneca Motor Car Co. at Fostoria, Ohio.

C. L. Alexander has been appointed manager of sales promotion for the Elgin Motor Car Corp., Argo, Ill. He has been connected with the automotive industry since 1911 holding positions as head of the car order department of the Lozier Motor Car Co., assistant supervisor of districts for Dodge Brothers and director of distribution for Maxwell-Chalmers. Since October 1920 he has been associated whith the Elgin company in the capacity of assistant sales manager.

Guy H. Peasley, for ten years associated with the company, has been appointed sales manager of the Olds Motor Works, Lansing, to succeed Charles A. Tucker who returns to the Nebraska Oldsmobile Co., Omaha, of which he is president and general manager.

M. A. Weissenburger has been promoted to the position of manager of city sales for the Cleveland-Cadillac Co., Cleveland. Warren Wright, for many years identified with the service department of the organization, has been placed in charge of a branch distributing office at Canton.

J. O. Eaton, for some months a joint-receiver of the Standard Parts Co., Cleveland, has resigned to devote himself to bringing about a reorganization of the $20,000,000 corporation that has been in the hands of a receiver since last September. Mr. Eaton will cooperate with the creditors' committee which has presented a plan for placing the corporation on a permanent business basis.

M. M. Venable, in the automobile business in Atlanta for the last ten years, has organized the Venable Motor Co. in that city to handle the Roamer car.

E. R. Fearnside has resigned from the Neel-Cadillac Co., Philadelphia, to join the sales force of the Sweeten Automobile Co., Philadelphia distributors of the Lincoln. D. Norman Longaker has also become affiliated with the sales force of the Sweeten company, of which W. A. Hamill is sales manager.

Ralph D. Webster, formerly sales manager of the controlling wire wheel organization, has rejoined the selling forces of the Wire Wheel Corp. of America and will make his temporary headquarters in Detroit.

Fred G. Whipple, division sales manager for the Service Motor Truck Co., Wabash, Ind., has been placed in charge of service truck sales in California, Arizona and Nevada. Walter Dix, formerly of the Packard Motor Car Co., has been appointed to Mr. Whipple's former territory which includes Maryland and Virginia as well as parts of Delaware and North Carolina.

Campbell Wood, well known to the Southern trade, has joined the sales force of the Klaxon Co.

Detroit Dealers Formulate Plans for Unusual Activity

Detroit, May 12—Plans for unusual activity in every branch of the automobile industry were formulated by members of the Detroit Automobile Dealers' Association at the annual April meeting. The newly elected board of directors submitted policies that will govern the organization for the year and outlined plans for several new branches of endeavor, all of which met with the unanimous approval of the membership.

The program will follow many lines of activity aside from the annual automobile show, which heretofore has been the outstanding feature of the organization's efforts. R. M. McConnell, vice-president of the National Bank of Commerce of Detroit, Ray Peed of Toledo and Wayne Hearne of Chicago, who attended the meeting, spoke briefly on the various phases of work which can be done by the Association to promote the interest of the owner, as well as those in the industry.

REO DEALERS ENTERTAINED

Baltimore, May 13—A luncheon was given at the Automobile Trade Association headquarters by H. D. Howell, owner and manager of the Howell Motor Co. Among the speakers were Mr. Howell's county dealers and salesmen and city salesmen, Mayor Broening, of Baltimore; John Mackall, chief state highway engineer, and A. H. Bishop, president of the Baltimore Automobile Trade Association. In the evening, Mr. Howell entertained his guests in his showroom with movies, showing the manufacture of the Reo car.

24.77 MILES ON GALLON OF GAS

Chicago, May 12—In an enclosed car cross-country contest, conducted by the Elgin Motor Car Corp. and participated in by dealers in various parts of the country, 21 cars covering a total distance of 3185.77 miles made an average of 24.77 miles to the gallon of gasoline. The average distance covered by each car was slightly over 150 miles. One of the objects of the contest was to determine the utility of the enclosed car for cross-country touring.

DURANT PLANT IN OAKLAND

Oakland, Cal., May 12—R. C. Durant, son of W. C. Durant, returned here today and announced that the Pacific Coast assembly plant of the Durant Motors, Inc., is to be built in Oakland and construction is to be commenced within the next thirty days. The Durant organization on the coast is to be operated under the name of the Durant Motor Co. of California. The younger Durant is to hold controlling interest and serve as president. Associated with him are A. L. Warmington and C. M. Steves, two former Chevrolet officials, who were associated with him in the Pacific Coast Chevrolet organization of which young Durant was at the head until March 1 when he resigned to join his father in the new Durant enterprise.

Dates for Automobile Salon in New York and Chicago Set

New York, May 12—Next season's automobile salon will be held in this city Nov. 27 to Dec. 3 and in Chicago on a date coinciding with that of the National automobile show which as heretofore will be about the end of January.

The entire second or ball room floor of the Hotel Commodore will be used for the forthcoming salon in this city. Nearly all of the list of car and custom body builders participating in the last salon have again arranged for exhibition space.

The Chicago salon will be staged in the ball room and adjoining French restaurant of the Drake hotel.

DO YOUR EMPLOYEES WORK IN SAFETY?

(*Concluded from page 9*)

at the side of the spigot can be done away with by merely turning the spigot upside down as shown in one of the illustrations. The market, however, affords excellent drinking fountains and one of the best investments a dealer can make is to provide means of this kind for the needs of his employees.

ATTEND SMALL HURTS

Every service station, especially those employing a large number of people, should have facilities for rendering first aid to the injured. It does not mean that aid should be administered only to those who are badly injured but to those who have received cuts or burns, slight as they may seem.

One large manufacturing concern in the East states that about 13 per cent of its lost time on the part of employees was caused by infections from wounds that were considered slight. Eight per cent of them were not reported until the employee began to lose time. This concern now is doing everything in its power to render proper treatment for even the slightest cuts, scratches, etc., and to have the men report them immediately.

It would not involve much expense to fit up the dealer's service station with a small first aid outfit. In fact, many of the better class service stations, equipped with shower baths, etc., are fitted out with a small cabinet, usually enameled white, containing the necessary articles for rendering first aid. One dealer goes so far as to have a doctor come in every so often to give the men an examination.

This has resulted in much good, as they not only get the benefit of the examination, but feel that the organization is looking out for their physical welfare. And having the men physically fit is one of the surest ways to promote good work and insure safety in service.

Production Below Schedule

Output Shows Increase Over March—Manufacturers Report Gratifying Sales Record With Slowing Up in Demand Due to Price Reductions and Expectancy of Further Cuts

DETROIT, May 13—A sharp step up in production at the Ford, Studebaker, Chevrolet, Dodge and Buick plants brought April production to 140,955 cars as compared with 105,245 in March. While this increase is looked upon as gratifying, it is considerably below the schedules outlined by all manufacturers who figured to hit around 60 per cent of normal with many of them predicting outputs all the way up to 90 per cent.

The increase in great measure was due to production at the Ford factory, where 90,125 cars and trucks were turned out in April. Dodge increased its production approximately 8,000 cars. Both the Dodge and Ford records were considerably in excess of the output for the same month in 1920. The Buick increase of several hundred cars over March was approximately 3,000 under that of April last year. Chevrolet has failed to hit the record of 1920 for April, but increased its output over March about 2,000 cars.

Lincoln Motor Co. built an average of 15 cars daily during April and now is operating on a schedule of 17 daily. Olds Motor Works produced about 2,800 cars approximately the same as last year and a few hundred over March, 1921. Production at the Packard plant was 625 Single Sixes as against 670 in March and 700 Twin Sixes in April a year ago. Paige slumped slightly in April.

Reo produced 2,750 cars and speed wagons as against 2,350 in March, but the output showed a decrease of about 300 as compared with last year. Studebaker went approximately 3,000 ahead in March.

REDUCTIONS CAUSE UNREST

All manufacturers report gratifying records during April with prospects of a steady increase until announcement came of price cuts on several cars. Reductions, they say, depressed the market and created a waiting tendency among buyers on the presumption that all other cars would be cut in price. Manufacturers in Michigan, however, with the exception of one or two, contend there will be no other cuts. The two referred to according to reliable information are planning reduction about July 1st. Full effect of the cuts already announced has not been felt in the opinion of manufacturers, though the laying off of men in a number of institutions and the cutting of time are declared due solely to the slow up in demand as a result of the unrest created by the reductions.

Inability to secure bodies resulted in curtailment of production at the Reo factory which built an average of 50 cars and 60 speed wagons daily. The plant's capacity is 180 and at the beginning of April it was hoped to reach close to that figure. Company officials said the demand was good and but for the inability to secure bodies, production could have been maintained. It is interesting to note in connection with Reo that the farmer business now totals slightly over 8 per cent as against something more than 16 per cent last year. The plant will continue through May on practically the same schedule as in April working short time but with a full force.

Olds shipments during the first quarter were approximately 5,000 cars as against 8,500 for the same period last year, but even with this decrease Olds record for shipment percentage is the highest in General Motors group. Olds is working full time and with practically normal force, building fours at Saginaw and light eights at Lansing with a few heavy eights being turned out occasionally. No trucks are being produced at the Olds plant.

FORD BENEFITS BY CUT

Ford, according to other manufacturers and dealers, is the chief beneficiary of price cuts. Ford dealers are using the argument with prospects that all cars will come down and are urging buyers to purchase a Ford, use it a month or two until reductions on their favorite car are announced when they can turn over the Ford with a loss of $50 or $100 and save considerable money on the car they had planned to buy, having had the use of the Ford in the meanwhile.

Lincoln Motor Co. reports good demand in New England, New York and on the west coast, and President Leland said the company is shipping all the cars it can manufacture. Lincoln increased its distributors from 15 to 50 in the last 60 days.

The business of parts manufacturers shows a slight increase, but is still behind expectations. Continental is operating on a 55 per cent basis and expects to move upward, reaching 65 by July, when the curve downward is expected. Firms building for Ford appear to be in the best condition and reports on Ford activity and business they say gives promise of keeping their plants operating. A rumor that Ford will close down July 1 is prevalent in Detroit but is denied vigorously by factory officials.

BODY BUILDERS INCREASE

The Auto Body Co. at Lansing announces releases from various factories including 1,000 bodies for Briscoe Motor Corporation for May. Scripps-Booth, Oldsmobile, Auburn and General Motors Truck Co. also have authorized more releases on bodies. The body company is employing 350 men and expects to add 150 more in the next 30 days.

Motor Wheel Corp. reports payroll now larger than at any time since the first of year. In the last 60 days the payroll has been increased by 400. Wilson Foundry & Machine Co. at Pontiac expects to be working 50 per cent capacity by the middle of May with a large increase in the force. Workmen are being added daily. The O. J. Beaudette Co., Pontiac, has 1,085 men working in the body shop. The plant is also working a night crew in the metal and tool departments. Michigan Drop Forge also has returned to normal as to men employed, with production somewhat in excess of normal. The plant is working 20 hours daily with two shifts.

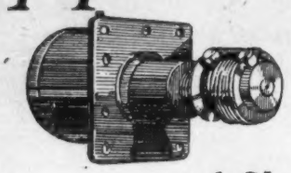
Dodge and Ford Go Ahead

DODGE and Ford went ahead of their production for April of last year and while Buick produced more cars than in the preceding month it fell short of the output of a year ago. The same is true in the case of Chevrolet. Body builders have increased their schedules, the lack of bodies having been felt by Reo which curtailed its operations on that account.

The recent price reductions in some lines have had their effect, hesitancy being shown by prospects. Ford dealers are making capital of the cuts in other lines and are boosting their sales through arguments based on such reductions.

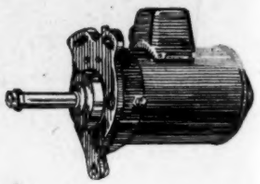
Parts manufacturers are increasing their business but the volume is not meeting general expectations.

How the Electric System Works



Article VI

By A. H. PACKER
Instructor, Ambu Engineering Institute



A Short Series of Articles Wherein Is Given the Fundamentals Underlying the Operation of the Modern Electric System as Applied to Automotive Apparatus

I HAD put off the evil day that I knew was coming a little too long, and wishing I had put on new tires didn't help much. Two shoes had blown while I was still six miles from Westville and every minute of the run in I was expecting another one to pop, but mile after mile was passed and fortune smiled until I pulled up to Bill Fixit's shop where I knew I could get help from the red head. He was on the job as usual, smiling and ready to help, also ready to get any tips I could hand him that would help in his electrical work.

Red soon had me fixed up with a couple of new casings, and I started to pump one of them up as Bill's air line was out of commission. I hadn't pumped very long when I quit for an instant and the pump handle started to rise. Red noticed it and said, "Hey, you forgot the valve inside, how do you expect the air to stay in?" "May be you're right, but what do you need 'em for," I replied. "Well," said the red head, "I don't exactly see myself but I know that someway they let air get in and then when it wants to get out again the valve won't let it." "Well, Son," I said, "that was a bone head trick on my part, but I am glad I did it for it illustrates something we need in our electrical work as well as in pumping up a tire.

In Fig. 1 we also have the action of a pump shown, where the rotation of the pump blades picks up water from the lower tank and forces it to the upper tank, but what will happen when we stop the pump? The answer is plain, for as there is a connection from the upper tank to the lower one through the passages in the pump, the water will start to run back, and the upper tank will soon be emptied. If we have an arrangement as in Fig. 2, however, the action of the check valve will still let the water go from the lower to the upper tank when the pump operates, but as soon as the water tries to return on stopping the pump, the valve will be forced shut, preventing the upper tank from emptying into the lower one.

The electrical device that accomplishes this same purpose is called a cutout switch, and its action is to allow the generator to charge the battery, but when the generator stops, and becomes just a network of wire, the action of

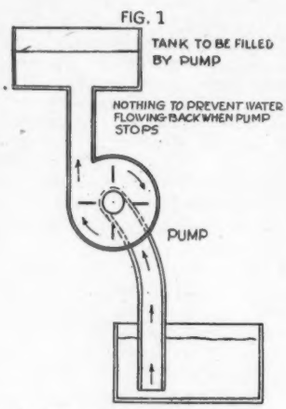


Fig. 1—Illustrating by the use of a water analogy what happens in an electrical generator and battery charging circuit when no cut-out is used

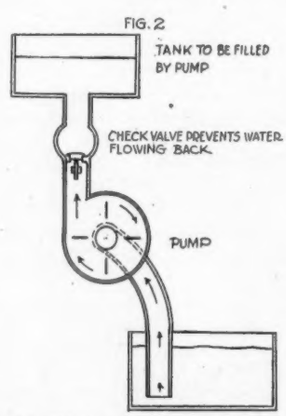


Fig. 2—With the reverse current or check valve in place there is no possibility for the current or water to flow back into the tank or through the generator

this same cutout switch is to disconnect the generator from the battery, to prevent this discharge current from flowing. In Fig. 3 is illustrated a generator, the armature of which is supplying current to its own field and also current to charge the battery. We know, however, that its ability to generate depends on its CUTTING lines of force, so that when it stops it generates no voltage, and the battery, therefore, would send current through both of the generator windings and would soon be discharged. This is like the action of the water in Fig. 1.

In Fig. 4 is shown a type of cutout switch, the main part of which is an electro magnet, a fine winding on one of its arms being connected to the generator brushes. The electro magnetic effect when strong enough will pull down the piece of soft iron pivoted above it, overcoming the spring which tends to hold the contact points open, and completing the circuit from the generator to the battery. With the proper strength of spring and properly designed coil, this action can be made to occur when the generator has built up to about 7 or 8 volts. As the battery voltage will be in the neighborhood of six the generator voltage will overcome that of the battery and force it to take a charge, the ammeter indicating the current that flows to charge the battery. With but one coil on the cutout switch the action in cutting in is O. K. but the operation in disconnecting the battery when the generator slows down is not so good.

We all know that the nearer you put a piece of iron to a magnet, the greater the pull on it. It, therefore, happens that while a certain magnetic pull was necessary to close the cutout switch, it does not take nearly so many ampere turns on the arm of the electro magnet, to keep the points closed. The amperes in the fine winding of the cutout switch are due to the voltage of the generator, which although it drops when slowing down, can not drop much because the cutout keeps it connected to the battery.

The slowing down of the generator, therefore, drops the charge current to 5 amp., then 2 amp., then 2 amp. discharge, then 10 discharge, and perhaps to 20 amp. discharge when the generator comes to a standstill, while the battery, if in fair condition, is able to give out this current to the generator, and still maintain nearly 6 volts at the ends of the fine winding of the cutout coil. This will result in the battery becoming totally discharged before the cutout will let go, as the voltage would have to drop to about four before the spring could overcome the magnetic effect, and pull the points open. This action of cutout switch is remedied by the use of another coil called a series winding, shown on the right leg of the cutout core in Fig. 5, and it will be observed that when charging the battery, the action of this coil is to help the shunt

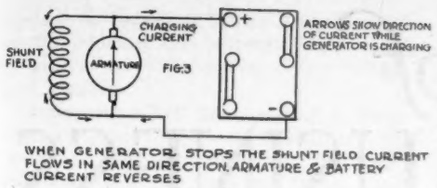

SHUNT FIELD
CHARGING CURRENT
ARMATURE
FIG.3
ARROWS SHOW DIRECTION OF CURRENT WHILE GENERATOR IS CHARGING
WHEN GENERATOR STOPS THE SHUNT FIELD CURRENT FLOWS IN SAME DIRECTION, ARMATURE & BATTERY CURRENT REVERSES

Fig. 3

coil hold the points closed, although it has no effect until the shunt coil has first closed the circuit.

When the generator slows down and generates less and less voltage, it reaches a point where the charging current stops, then reverses, and becomes a discharge current drawn from the battery. To flow from the plus side of the battery, through the ammeter to the generator, it must flow back through the series coil of the cutout, in the reverse direction from that of the charging current. This then reverses the magnetic effects of this series coil, which now opposes or bucks the magnetic action of the shunt coil, instead of helping it.

Let us assume that we have in the shunt coil 1,000 turns carrying .3 amp. giving 300 amp. turns and that this magnetizing action must be reduced to 240 amp. turns before the spring will be able to open the points. Let us further assume that we have 15 turns in the series coil and that the generator has slowed down until the battery discharge is 4 amp. This series bucking effect will then be 4 times 15 or 60 amp. turns which will oppose the action of the shunt winding to such an extent that the points will open.

At the instant the points open, the shunt coil becomes disconnected from the battery, and the much lower voltage of the generator can not again close them, until the engine speeds up and the voltage of the generator rises above that of the battery.

With the use of a series coil the tendency of the cutout switch to stay closed is no longer a disadvantage, but an advantage, for the instant the switch arm starts to move, the magnetic pull becomes stronger, and the points go together with a snappy action. Without this characteristic, the points close slowly and also open slowly, drawing an arc, which results in burning of the points. The resultant sticking eventually prevents opening of the contacts, and a discharged battery is the result.

A well designed cutout switch should close at such a time that there will be a charging current of about 1½ amp. If the point action is slow or the cutout opens while drawing a very heavy discharge current, the points tend to burn. One trouble that may be encountered is therefore a burnt condition of the points, which may not prevent the mechanical action of the armature, but may prevent the points making a good electrical connection when they do touch. The remedy is to smooth up the points with a thin file and adjust the cutout so that it does not open with a heavy current flowing. If the switch does open too late, it is due to too weak a spring or to too small an air gap between the pivoted arm and the U shaped core by which it is attracted. Similarly, failure to close soon enough is due to too strong a spring or to too great an air gap.

The commercial cutout switch as used on the modern automobile generator has three terminals as indicated by the numbered points on the diagram in Fig. 5. No. 1 is usually marked generator. No. 2 may be marked Bat. and Gen. or in grounded systems, the base of the switch may be the No. 2 terminal and may not be marked at all. The third terminal may be marked battery. Defects in the windings are of two kinds, first an open circuit which is most likely to occur in the shunt coil as this is made of fine wire and is easily broken. To test for this trouble a 110 volt lamp circuit may be used, and if the test

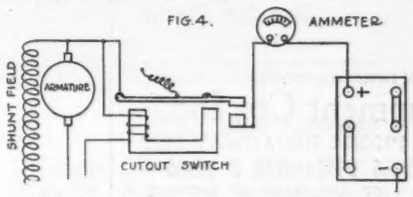


Fig. 4—Above is shown by a simple diagram the action of cut-out in the electrical circuit between battery and generator

points are touched to terminals that correspond to No. 1 and No. 2 the points should close with a snap. Connected to 8 volts of a battery they should also close with a snappy action, indicating that the shunt coil is O. K.

The other likely trouble is found in a cutout that has just been installed, and which was not thoroughly tested when built. It is a reversal of the direction of winding of one coil with respect to the other, which does not prevent the points closing but causes the series coil to have the wrong effect. The generator current to battery, therefore, opens the points causing a vibration and burning action, and when the points should open, the series coil holds them shut, causing the battery to discharge through the generator. This can be corrected by reversing the connections of either coil depending on which is the easier.

The type of cutout switch just

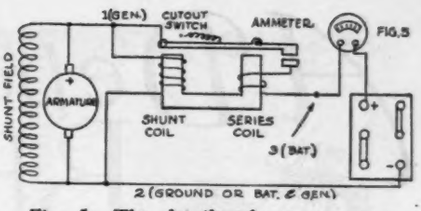


Fig. 5—The details of a motor car battery and generator circuit cut-out is shown above

described is used on most generators for automotive service, although there are other methods of connecting and disconnecting the generator and battery. On some types of generators, centrifugal action of revolving weights has been made to close a pair of contacts when the generator was up to certain speed, this system assuming that the generator builds up its voltage at this predetermined speed. The Remy motor cycle generator used by the Harley Davidson machines is a sample of this type.

In some Delco machines the action of the ignition switch is made to connect the battery to the generator as well as to the ignition circuits, with one throw of the switch button or handle. Current to the generator then runs it as a motor, a ratchet action allowing the generator to turn while the engine stands still. As soon as the engine starts, however, the generator is driven by the ratchets and their slipping action is discontinued. In this manner the usual cutout is eliminated and the generator is disconnected at the same time that the driver shuts off the ignition. Should the engine stall when the car stops and the driver forget to shut off the switch, the generator runs again as a motor, and the clicking sound of the ratchets serves as a warning that the switch has been left on.

The way in which a generator charges the battery and then slows down and tries to operates as a motor is not always clearly understood, although this action takes place every time a cutout operates. We have been considering the action of generators where electrical voltage and current was produced by the motion of wires through a magnetic field, and we know that if this produces current today, it will do so tomorrow for the laws of electricity are unchang-

(Concluded on page 42)

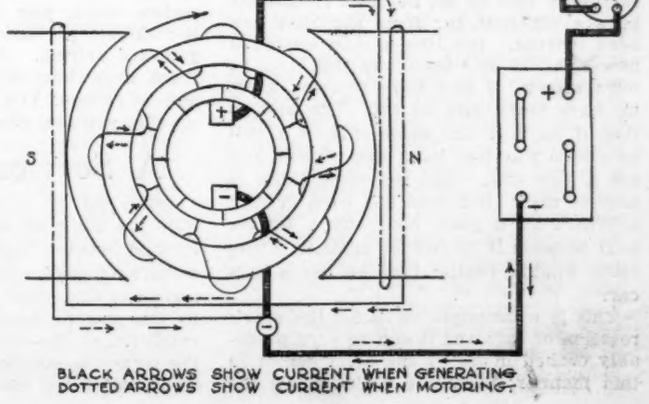


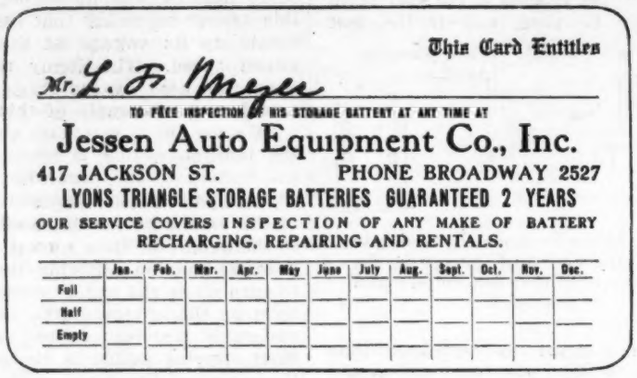
Fig. 6—The reversible action of a generator which attempts to run as a motor when it slows down below the average and necessary speed, is shown by the diagram at right

A Department of BETTER BUSINESS

A dollar will be paid for all ideas accepted as Better Business — Perhaps you have some.

Conducted by Ray W. Sherman

A Reminder to Avoid Battery Troubles


This Card Entitles

Mr. L. F. Meyer

TO FREE INSPECTION OF HIS STORAGE BATTERY AT ANY TIME AT

Jessen Auto Equipment Co., Inc.

417 JACKSON ST. PHONE BROADWAY 2527

LYONS TRIANGLE STORAGE BATTERIES GUARANTEED 2 YEARS

OUR SERVICE COVERS INSPECTION OF ANY MAKE OF BATTERY RECHARGING, REPAIRING AND RENTALS.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Full												
Half												
Empty												

FIGURING that the early spring months of automobiling are fraught with battery troubles to motorists, because they have not yet "gotten back into the stride" of taking proper care of the vital part of the equipment in the battery box, the Jessen Auto Equipment Co., sends out a reminder letter to a good list of owners, enclosing a card entitling the bearer to free inspection at any time. The card contains a record form for each month, with a place to check in whether or not the battery was "full," "half" or "empty." The card contains an outline of the services offered by the company. The letter contained the following: "Have you ever stopped to realize that fully 90 per cent of all battery trouble is due to negligence? The average man little considers the true value of his battery until he finds himself without lights and starter. In an effort to reduce to a minimum such annoyances, which are both costly and aggravating, we offer the enclosed service card which entitles you to free inspection every other week, regardless of make. We look forward to having you join the thousands who profit by our service and years of experience." Much business has resulted.

Profit by the User's Rotation of Cars

Nowadays when a man buys a new car every year or so, he quite frequently buys a different car from the kind he's been driving. It's like a man buying a new suit. If he's been wearing blue, he buys brown; if he's been wearing gray, he buys black and so on. The idea is that if he buys the same sort of a suit he's been wearing, folks won't know he's got a new suit. And the same thing is true of cars. If a man has been driving a Whizz for a year, he'll buy a Buzzer next because if he bought another Whizz folks would't realize that he has a new car.

This is what might be called the user's rotation of cars and it can be very profitably cashed in on by the alert dealer in this manner: Compile a list of all the men who are this year driving cars of about the same price and class as those you sell, or cars which are a little under the class you sell. Then next year or during the present year if their cars are rather worn, you can broach them on the subject of buying the kind of a car you are selling. And while talking to them, urge them to rotate cars from season to season. You'll find that by doing all this you can stir up a lot of business.

A Service Salesman

Send one of your good service men, with his name on an engraved card as a Special Service Representative, to all the owners of cars sold and served by you and have him bring back a report, signed by the owner, showing what the general condition of the owner's car is, whether the owner is satisfied, what the owner is thinking of the service you render and whether the owner is considering the purchase of a new car and, if so, of what make.

This is what Howard E. Laux, Oldsmobile dealer in Mt. Vernon, N. Y., does and he reports that the plan has aided him greatly in increasing his list of satisfied owners and in helping him learn which of his customers and, incidentally, their friends intend buying new cars.

Moreover, such a plan enables the dealer to straighten out any minor troubles that may have developed in the car, and it helps in sales work for the prospective buyer can be shown the signed reports which prove the purchasers to be satisfied owners.

A Letter That Brought Results

A letter that brought an unexpectedly large volume of business for new tops, trimmings and paintings, used by the Mechanics Auto Co., Milwaukee, was as follows:

"Spring is here—summer almost upon us. Is your car ready? Is something not just right? We are in a position to take in your car and do all the necessary work required, and at prices which you will be convinced are reasonable. All of the work is done by experts in their lines which assures the best work. Phone us, or a line from you will have our representative call on you. Or, if possible, we would suggest you see us, for we could then show you our complete shops, also the numerous cars we are making as good as new."

The success of the letter is ascribed to its brevity and the strong suggestion in the opening sentences.

Chalking Batteries to Satisfy Customers

It has been said that in some service stations, particularly the small ones, one will occasionally find batteries on charge without any mark recording their progress. In such cases, the battery man no doubt relies entirely upon his memory, because of the small number of batteries involved, as to the condition of each battery.

This is a very poor practice, and even though the proper record is not kept on the battery claim check card, the progress of the battery, should at least be

made even though it is only a chalk mark on the side of the battery. This could be merely an abbreviation of the voltage and gravity.

Sometimes when the customer is skeptical of your reports of a battery's inability to take a charge, you can dispel his suspicion by showing these chalk marks on the side of the battery.—Vesta Twelve-Eighty.

Samples of Work Booster for Business

The Iowa Radiator Co., Marshalltown, Iowa, radiator repairmen, believe so much in the quality of their work that they are submitting a sample of it to the public. In the show window of their shop, they have on display a sample of a radiator both "before" and "after." The "before" display shows a badly damaged radiator before repairing, while the "after" display shows one very neatly repaired. An explanatory card is placed with each display. The display has attracted the attention of the public to the class of work the shop turns out.

Service—Satisfaction at a Reasonable Price

The Clemens Auto Co. of Des Moines, has defined service in a way that leaves no doubt in the customer's minds as to what the service policies of the company are. The service manager has placed a sign over the door that leads to the service department reading as follows: "SERVICE MEANS SATISFACTION AT A REASONABLE PRICE."

Keeping Up With Times in Advertising

An interesting method of keeping the dealer's car advertising right up to the minute would be to watch the local papers every day for items concerning prominent men in the city making speeches, going on trips, being elected to various offices and so forth and then to quote the items and also to state the person mentioned drives a new car purchased from the dealer. Such advertising might read like this:

"D. G. WHITE was elected president of the Rotary club yesterday.—Item in the Evening Press.

"Mr. White of course drives a ——— car purchased from us.

"Watch our ads to see the names of other live-wire progressive local business men who are driving ——— cars."

Such advertising would have a personality and a timeliness and an authority that other advertising might not have.

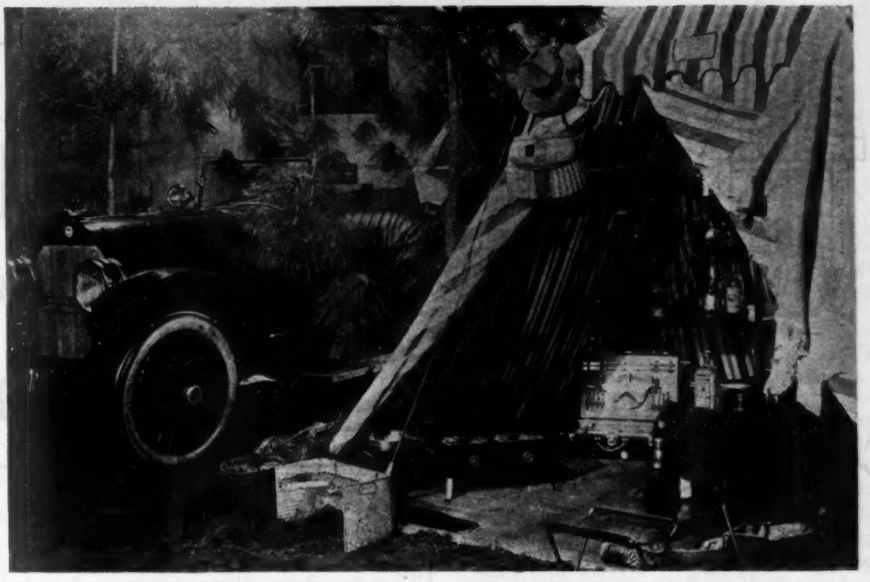
Establish a Reputation in Making Sales

It is the dealer's own personal reputation that he sells with every car along with the reputation of the manufacturer. This fact was recently emphasized by the Northern Indiana Motor Car Co., of Fort Wayne, Ind., by an advertisement reading like this:

"FOR SALE—A Reputation.

"Look away from the car for a moment and imagine that you are buying an interest in an establishment that deals in automobiles. Then decide about the car. Whenever you buy a car, you buy the ability of the dealer to see that you are CONSTANTLY satisfied with the car's performance. We regard every investment in one of our cars as an investment in us. We are here to deliver satisfaction every day you own the car.

"The good cars come from good dealers."



This Salesroom Setting Looks Real

Los Angeles dealers entered fully into the spirit of the call-of-the-open-road week and as a result have found that sales have been greatly stimulated. The spirit was evidenced not only in the window displays but in the salesroom decorations. Walter Brown, Stutz dealer, made his window so attractive that no one who saw it but wished he were in a position to benefit by its allurements. This window was a success because it paid dividends to the dealer

Used Intensified Campaign in Truck Selling

Despite the recent slackness in the truck industry, D. F. Poyer & Son, Transport truck distributor in Los Angeles, has kept enough business going right along to warrant the erection of a new plant. The company did it through—

1—Carefully planned intensified selling program.

2—A steady, hard hitting advertising campaign.

"We cashed in on every factor of our business," D. F. Poyer says. "We made every owner of one of our trucks a salesman. We pepped up our dealer organization so that there was not a dealer or salesman who failed to follow through to the finish on a prospect. Our service department to owners and drivers was perfect. Our advertising slogan, 'Poyer's Dependable Service' was a byword to hundreds of operators who reaped the benefits from it and were reminded of it continually by advertisements in the leading newspapers of Los Angeles.

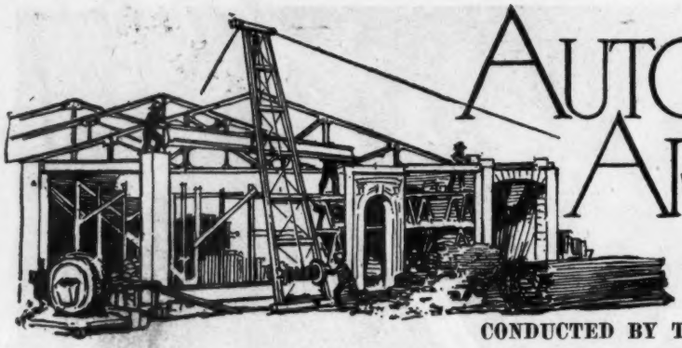
Heeding Call of the Road With a Camera

"The open roads are calling you and your car," reads an announcement in the Grower, published by Strong Motors, Inc., and Buelte Motors, Inc., Chandler and Cleveland distributors in Rochester. "The country, the woods and the water are calling you and your camera." That is the why and wherefore of the Grower's camera contest.

The contest is open to all owners of the cars in the territory of the distributors and continues for three weeks. It is one of the means adopted by the distributors to show the owners that they are still maintaining an interest in them and are intent on keeping them together as one family. It will count when the time comes around for the owner to buy another car or when he needs service.

A Woman Driver as Asset for Dealer

Every woman who drives one of the cars sold by the dealer is an advertising and sales asset for the dealer. The fact that a woman drives a certain kind of car means that the car is easy to operate and that it is, therefore, the sort of a car that other women could operate with equal ease. Consequently it would be a good idea for the dealer to secure the names and addresses of women who regularly drive some of the cars he sells and to also secure photographs of these women. Then this data could be used to splendid advantage in selling cars to family men whose wives are ambitious to drive cars.



AUTOMOTIVE ARCHITECTURE

Planning and Building Problems

CONDUCTED BY TOM WILDER

Paint White to Obtain More Light

THE value of white walls and ceilings in the diffusion of light has been pointed out repeatedly here. Especially is this true of lower floors where skylights cannot be resorted to and where all the light comes through side windows. An interior, however, cannot get too much light and where light seems ideal it still can be improved and made softer and more uniformly diffused by a liberal application of white paint. White paints are made in many forms suitable for this purpose. There is plain old fashioned white wash made of lime slaked in enough water to give a creamy consistency. Then there are the prepared cold water paints which are more or less of the nature of calcimine and have whiting for their base.

Zinc for Interior Use

White lead, although the ideal base for white paint should not be used for interior work as it will invariably turn yellow in a short time. Zinc is much better for all around interior use and the garage owner may mix his own paint if he uses oil paint by getting finely ground white zinc and mixing it with pure linseed oil to the consistency of thick cream after which it is thinned with benzine or turpentine to the right consistency for use.

There is on the market a very extensively advertised product called "Barreled Sunlight" which is designed to fill just this particular need. We do not know of what the mixture is composed beyond the fact that it is an "oil paint" and very strongly guaranteed to stay white longer than any other gloss paint applied at the same time under the same conditions. It is claimed not to chip off and dries to an even glossy surface.

The manufacturers, the U. S. Gutta Percha Paint Co., Providence, R. I., will send a sample board painted with barreled sunlight to those requesting one. Whether whitewash, an oil, or water paint is used makes little difference so long as the walls are whitened, although for the sake of economy we want the walls to stay white as long as possible. The smooth glossy surface of the oil paints are also to be preferred to the dull surfaces of the water paints because dirt and dust does not cling to them so readily.

Automotive Architecture

IN this department MOTOR AGE aims to assist its readers in their problems of planning, building and equipping service stations, garages, dealers' establishments, shops, filling stations, and in fact any buildings necessary to automotive activity.

When making requests for assistance please see that we have all the data necessary to an intelligent handling of the job. Among other things we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

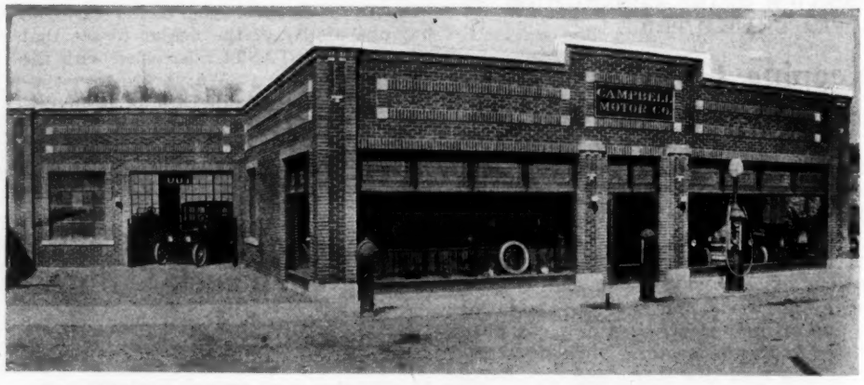
What departments are to be operated, and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how large an accessory department is anticipated.



Attractive Small Town Sales and Service Station

The new home of the Campbell Motor Co. of Mammouth Springs, Ark., is a very good example of the treatment a small town garage front should receive. The material is tapestry brick ranging from bright red to black laid with rolled joints and brightened by trimmings of pure white cement concrete. It is said to have cost less than the estimate, which is encouraging news to those contemplating building

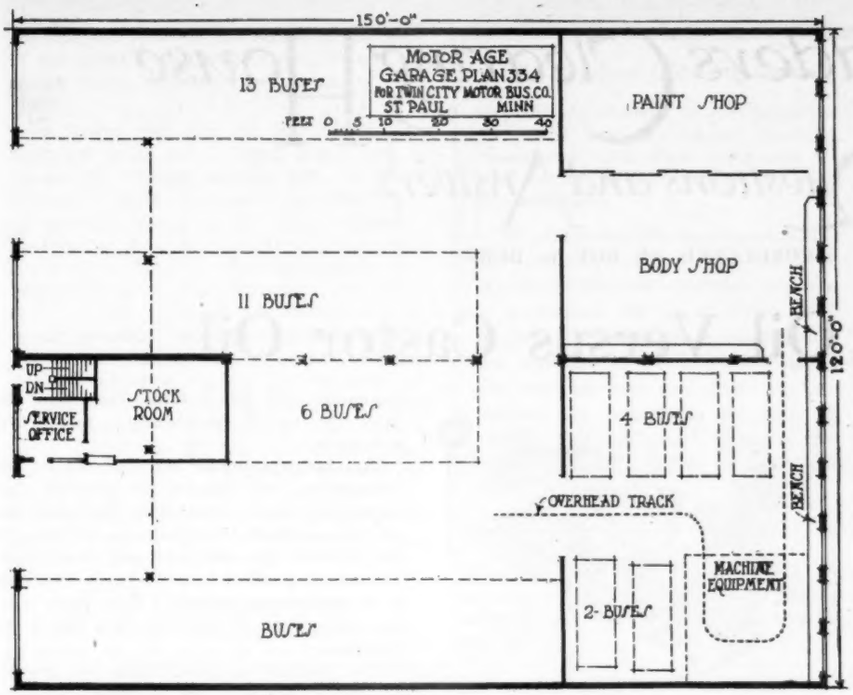
STANDARD OIL CO. OF CALIFORNIA PAVING ITS SERVICE STATIONS WITH ASPHALT

Comments by Mr. J. K. Firth, Jr., Manager Fuel Oil and Asphaltum Division, Standard Oil Co. of California

WE have done considerable asphaltic concrete base paving in our service stations at many points on this coast, and it is proving very satisfactory. We have paved four stations in San Francisco, one at Portland, one at Spokane, two in Los Angeles, and there are many others on the program.

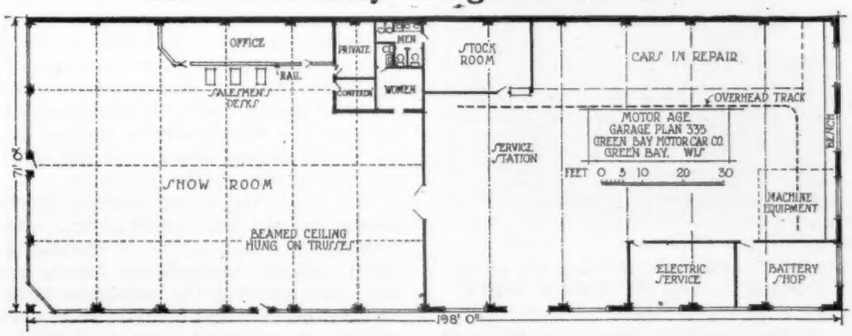
In developing a pavement for service stations we have now standardized on a 3½-in. asphaltic concrete base and a 1½-in. sheet asphalt surface. The sheet asphalt surface is used, due to ease in cleaning and its fine texture surface. Around the filling pumps where gasoline is spilled, often in quantities of a gallon or more, we paint the pavement with a paint that will wear, and will resist the effects of gasoline.

This is painted to a width of about 8



The above plan is one suitable for the storage and repair of a large fleet of trucks or buses. Posts should be held to the minimum as large vehicles are difficult to manoeuver

An Unusually Large Salesroom



The above calls for a larger salesroom than usually necessary. It is probable that the reader intends having some departments in another building

ft., and a length of about 12 to 15 ft. 'Cemetite,' manufactured by the Electric Paint & Varnish Co. of Cleveland, O., has proven satisfactory, and despite the hard winter's wear and the use of chains, this paint has not broken at any point and the pavements are in excellent condition.

The asphalt construction has many advantages in service station construction, as generally the pavement can be laid in one day, and so the service will not be held up for any length of time. It presents a pleasing appearance and can be kept clean or can be hosed down. We are also paving some of our substation yards in this manner."

Second Story Addition For Office

PLAN 334

We are contemplating the erection of a one story brick building 120 ft. wide by 150 ft. deep. We want a building suitable for storing about 24 of our own trucks and also want complete service facilities including one repair shop, body building shop and a paint shop in the rear together with a stock room for parts. The office, approximately 50 ft. wide and 25 or 30 ft. deep, should be in front. There is some question in our minds as to whether the office should be on the first floor or built up as a second story addition.—Twin City Motor Bus Co., St. Paul, Minn.

We have no way of judging the proportions your repair departments should be, but the way our plan is laid out the shops may all be extended at the expense of the storage space.

Your plan of building a small second floor for your office is a good one but you will probably need a small service or checking office on the first floor to watch the comings and goings of your buses. The second floor should also contain a chauffeur's room with all the usual accommodations.

If you support your roof on a double series of 60 ft. trusses you will overcome a great handicap as these buses are no doubt rather unwieldy to handle among posts. A few columns will be convenient, however, to support the second floor office section.

Service Station with Large Salesroom

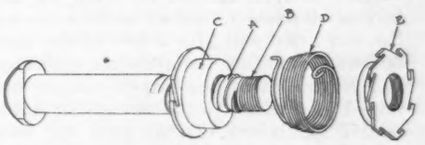
PLAN 335

We wish to build a garage on a corner lot 71 ft. on Main street, and 198 ft. on the side street, and would like sketches or plans for a one story building. We prefer to use the front 71 ft. and about 100 ft. deep for a display room.—Green Bay Motor Car Co., Green Bay, Wis.

Judging from the size of the showroom we presume you intend to carry on some of your departments under another roof, so we are at loss to know just what you intend doing with the rest of this space. If you use it for new car or public storage it can just be left open, but we have given a service station layout for want of some more definite idea.

Automatic Bearing Bolt

A NEW type of bolt for use on automotive equipment, in fact on machinery of practically every kind is being produced and augurs well to upset some of the old-time practices in service work, especially that incident to main and connecting rod bearing work. With this bolt, wear in the bearing is automatically taken out. Furthermore, it is not necessary in fitting the bearing to use exact methods in turning up the lock nuts on the bolt. The automatic bearing



bolt has both a right and left hand thread, designated by A and B in the illustration. The left hand thread carries the revolving nut C which is placed next to the bearing cap. This revolving nut is kept in place by a spring D, suspended from the ratchet nut E, which nut is run on the right hand thread and locks against the left hand thread, thereby doing away with the conventional cotter pin.

This nut is called the ratchet nut because the outer edge is grooved and the spring fastened to the revolving nut on one end and wound up tight and hooked into a ratchet. The thread on which the revolving nut travels is coarse and easily will stand the pressure placed upon it. Whenever there is any wear on the bearing, the down stroke of the piston relieves the pressure on the bearing cap and the revolving nut keeps the bearing up snug by virtue of the spring. With the bearing always at the proper adjustment, wearing out of the bearing is said to be very slow and there is no vibration in the engine, often the cause of main bearing trouble. No special tools are required to install these bolts other than a small wrench with which to set up the ratchet nut E. This bolt has been brought out by the Automatic Bearing Co., 751 Otis Bldg., Chicago.

The Readers' Clearing House

Questions and Answers

CONDUCTED BY ROY E. BERG
Technical Editor, Motor Age

Mineral Oil Versus Castor Oil

Q—What are the advantages and disadvantages of using castor oil instead of the ordinary oil as an engine lubricant?

2—What is the proper way to enlarge the valves on a Buick K-45?

3—Is there any difference in the actual horsepower developed in the 1920 Buick engine and the 1921 model?—Ralph J. Renner, Roanoke, Va.

The question of the necessity of using castor oil as a lubricant for our aircraft engines during the war was placed before a committee of lubricating engineers and a large number of tests were made to arrive at a satisfactory conclusion. The report shows that better results were obtained with mineral oil than with castor oil in the majority of cases.

A paper entitled Mineral Oil versus Castor Oil for the lubrication of internal combustion engines was presented before the Mid-West section of the S. A. E. by Wm. F. Parish. This paper covers the subject completely and is based on the results obtained in the air service during the war. We will give a few of the quotations bearing on the question answered and if interested the paper can be obtained by writing to the Society of Automotive Engineers, 29 W. 39th St., New York.

Considerable care has to be taken of oiling conditions where castor oil is used due to two of its weaknesses, i. e., gumming when hot and crystallizing and congealing when very cold. The gumming is taken care of by frequent drawing off of the oil in the engine sump or tank and the syringing of the cylinder heads with gerosene to keep the valves and piston rings free of gum. Castor oil gums fast at 250 deg. C., turning into a solid in three hours.

During the cold weather castor oil gets very thick and pours hard, so that it has to be kept warm for handling. When castor oil has set for a length of time and is allowed to become cold it precipitates a crystalline white substance which clogs up passages and filters.

The results shown by this series of tests fully justify the established American practice of using mineral oil for lubrication of internal combustion engines and proved beyond all doubt that castor oil was not as efficient, under the same test conditions as lubrication with the proper mineral oil.

Technically, there is no reason for castor oil being used as a lubricant for the internal combustion engines of the stationary type as long as the proper mineral oil is obtainable.

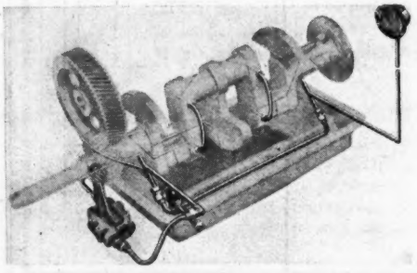


Fig. 1—Pictorial view of the oiling system used on the Oldsmobile 8

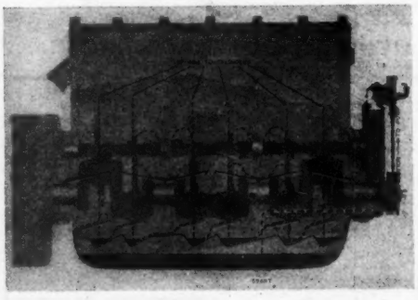


Fig. 2—Diagram showing the travel of oil through the Hudson engine

2—The proper way to enlarge the valves of the Buick engine is to take an angular reamer and cut out the valve seat to the size desired to accommodate the larger valve. Care will have to be taken to see that too much metal is not removed as it will result in breaking through to the water jacket. We have no blue prints of the engine and so cannot state how much the valves can be enlarged.

3—So far as we know the power developed by the 1921 engine is the same as that of the 1920 engine.

OILING SYSTEMS

Q—Publish sectional view of the Hudson and Oldsmobile light eight engines showing the oiling system.

2—How do you time the spark on a Packard?—John Wotring, Huntington, W. Va.

A diagram showing the travel of oil through the Hudson engine is shown in Fig. 2. The oil pump which is mounted at the front of the engine takes its oil from the reservoir, drawing it through a metal screen of fine mesh. The oil is fed directly into the front compartment containing the timing gears and their bearings and flows from this into the first oil trough immediately under No. 1 cylinder.

The large splasher on the end of the connecting rod practically empties this trough at every revolution, throwing the oil into suitable channels or gutters on the side of the reservoir and crankcase. The upper gutters feed the main bearings in a continuous stream. The lower gutter feeds the oil directly into No. 2 oil trough.

The continuous feed from one trough to another ends at No. 6 trough and the oil flows back into the reservoir.

The two center bearings are fed by two troughs each. The front bearing is fed from the timing gears and one trough and the rear bearing is fed by two large troughs.

The lubrication system used by the Oldsmobile 8 is of the circulating splash type. It consists of an oil pan having a capacity of four quarts of lubricant which is drawn out of the pan through a suction pipe which leads to the gear type oil pump located forward of the engine on the outside of the assembly.

This pump is driven directly off the crankshaft through spiral gears. After leaving the pump the oil is carried into the crankcase through the supply pipe and after entering the crankcase is carried to the rear and front main bearings and to the point of contact of the two front end gears. When the oil reaches the main bearings part of it flows between the crankshaft journals and bearing surfaces. The larger portion of the oil carried to the main bearings enters the crankshaft through a passage whose orifice matches the mouth of the oil supply pipe for a short period during each revolution of the crankshaft.

To insure that a supply of oil will enter the crankshaft whether the oil passages match or not, an annular groove is machined in the babbitt lining of the bearing directly over the path that the hole in the crankshaft journal travels, thus permitting a flow of oil into the shaft at all times. The oil after passing through the passage drilled in the crank cheek enters the crank pin nearest to the crankshaft ends.

At this point part of the oil leaves the shaft through an outlet provided in the crank pin journal, lubricating the connecting rod bearing and through two holes drilled through the back of the bearing oil is fed to the outer surfaces of the bronze-back bearing upon which the plain rod oscillates. The portion of

the oil not leaving the shaft at the end of the crank pins is conducted to the two crank pins nearest the center of the shaft.

In doing this the oil is carried, for instance, from No. 1 crank pin to No. 2 crank pin through a small pipe which is arched in such a manner that the mass of moving oil is at all times approximately the same distance from the crankshaft axis. The oil after lubricating the two surfaces of the connecting rod bearing is then through a combination of pump pressure concussion, and centrifugal force, thrown out of and off of the rapidly rotating bearing in the form of a mist which deposits a film of oil upon every part of the inside of the engine, after which the oil drains back into the oil pan through two mesh screens of large area and is then repumped. A diagram showing the oil pump and pipes through which the oil is conducted is shown in Fig.1.

POWER FOR EMERY WHEEL

Q—Can I run an emery wheel with the starting motor from an Overland 85? I want to run it from the town current which is 110 volts.—R. J. Fox, Homer, La.

1—We feel that it will be perfectly feasible for you to operate a 6-volt starting motor on a 110-volt circuit for the purpose of operating a grinder providing the connections are made as shown in Fig. 3. From this diagram it will be noted that 110-volt lamps are placed in parallel and this bank of paralleled lamps in series with the motor. To operate this outfit first see that all the lamps are out of the circuit then close the main switch. Next, screw the lamps into the circuit one by one until the current flow is sufficient to operate the motor. Remember that the starting motor is a series motor and if too great a current is forced through it that its speed will increase and increase to a disruptive point. A series motor should never be operated without load for it is a characteristic of this type of motor that its accumulative speed will finally burst the armature.

OIL PUMP TROUBLE

Q—An oil pump, of the gear type, on a 1917 Chalmers, Model 6-30, after putting new timing gears in the engine, will not pump with any pressure. All pipes are tight and clear. After priming, pump will pump a feeble stream but there is no pressure. Can you advise how to remedy this?—Tracy L. Scofield, Millbrook, Ill.

Since the engine has been partly assembled it is impossible for us to tell what has been done to the pump or whether the proper connections have been made. If the pump fails to work or only produces a weak strain after being primed it is usually an indication of leaks in the oil lines between the oil pump and the reservoir. After the pump has been disconnected or removed, the body of the pump must be filled with oil to insure operating quickly.

Turn ells to vertical position before connecting the oil lines and fill pump body with oil. Lack of detail prevents making any positive statements, but it would be advisable to check over the pump assembly and make another careful examination of all of the oil leads to see that they are properly connected and that all the connections are tight.

The Readers' Clearing House

THIS department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columes.

MEANING OF CYCLES

Q—What is meant by a two-cycle and a four-cycle gas engine? How do they fire and how often? Explain in detail, naming advantages of each.—H. B. Aram, Evanston, Ill.

The charactoristic feature of the two cycle engine is that there is an explosion in each cylinder during every down stroke of the piston instead of during every second down stroke as in the four cycle engine. The other feature which distinguishes the two cycle engine from the four cycle is that the combustion charge must be precompressed in order to get it into the working cylinder.

This is generally done in the crankcase, which is made gas tight and acts as a pump; but it is sometimes done by means of a pump formed by extensions of the working cylinder and piston or by an entirely separate pump cylinder. The four cycle engine has the four following operations, each of which occupies the time of one piston stroke:

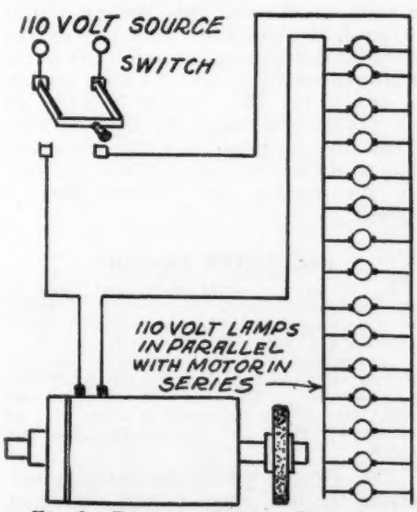


Fig. 3—Diagram showing the proper connections to be made if a 6 volt starting motor is to be operated with 110 volts

Admission of the charge to the cylinder. Compression of the charge. Combustion of the charge which includes its ignition and expansion. Exhaustion of the products of combustion. The incoming charge from the carbureter is admitted to the cylinder through the intake manifold and the inlet valve. The intake stroke of the piston is then coming down from upper dead center.

The inlet valve then closes and the piston travels up on the compression stroke. Ignition takes place when the charge is fully compressed and the effect of the sudden rise in temperature and consequent rise on pressure is to drive the piston down on the power stroke. The exhaust valve then opens and the piston forces the exhaust gases out on its next upward stroke.

To enter into a discussion of the reforces the exhaust gases out on its next spective advantages and disadvantages would take considerable space and would involve questions of design. One of the disadvantages of the two cycle engine applied in automobile use is the excessive weight of the reciprocating parts and the inability of the engine to function properly at low throttle. The two cycle engine, however, is used extensively in the marine field with highly satisfactory results.

LIGHT IRON PISTONS

Q—Would installing a set of De Luxe gray iron pistons in a Hudson car throw the engine out of balance?

2—Would it affect the power and speed of an Essex to install the same kind of pistons?—H. A. Storey, Sioux Falls, S. Dak.

1—The installation of the light weight pistons will not effect the balance of the engine and we understand that installations of this kind have been highly satisfactory. When making an installation of this kind it is advisable to weigh the pistons and get them as nearly the same as possible.

2—We do not believe that the installation of these pistons would have any material effect on the speed or power of the car. These pistons can be fitted closer than the aluminum pistons ordinarily used and this might cut down the chances for the development of oil pumping to some extent.

OIL PRESSURE REGULATION

Q—How is the oil feed pressure adjusted on an Oldsmobile eight, model 45—Geo. Brown, Campbellsport, Wis.

The oil pressure gage on the dash should show 10 to 20 lb. when the car is running at a speed of 20 to 25 m.p.h. The pressure is regulated by a pressure regulator located at the left hand of the crankcase and at the forward end. If the reading of the oil gage on the dash is too high screw out the serew in the regulator; if the pressure is too low screw regulating screw in.

CLEANING CELLULOID

Q—Is there anything that will toughen celluloid and prevent it from cracking?—Vernon W. Shepeard, Bridge Town, Tex.

If acetone is applied it will act as a cleanser, keep the celluloid transparent and prevent it from cracking. Acetone can be purchased at any paint store or drug store.

Wiring of 1915 Grant—Allis-Chalmers System

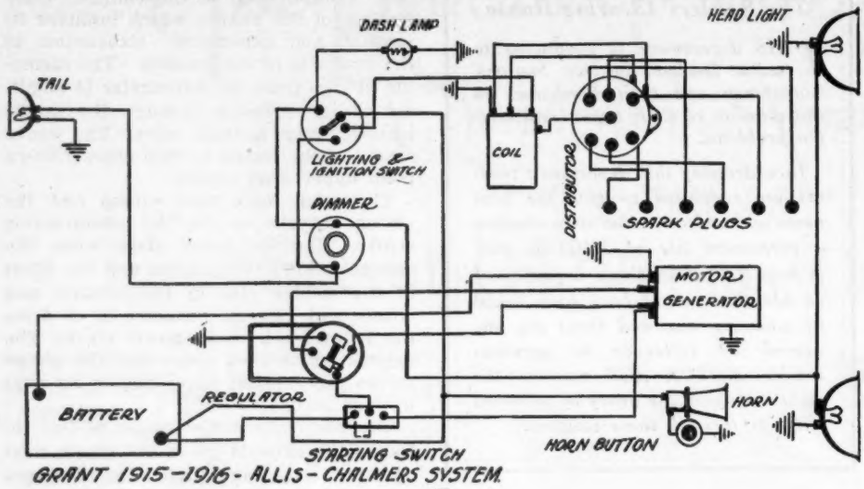


Fig. 4

Internal Wiring Allis-Chalmers Single Unit

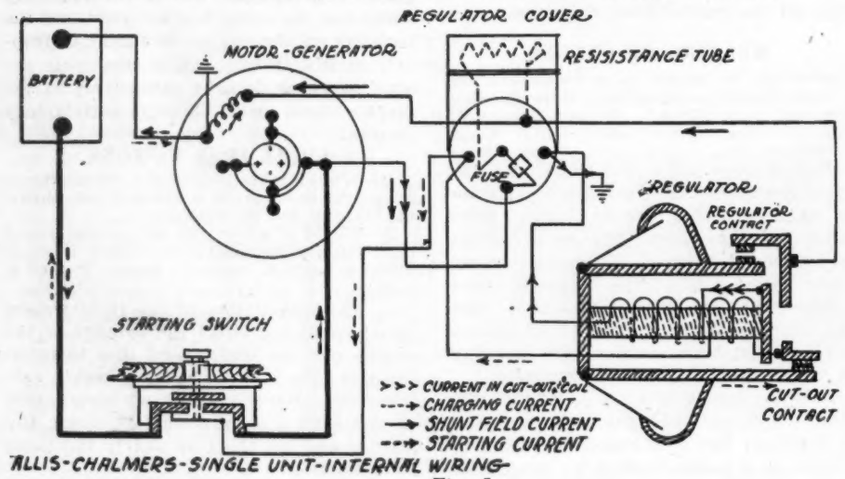


Fig. 5

STEERING GEAR ADJUSTMENT

Q—The steering gear in a 1916 Hudson binds, particularly when the wheels are headed almost straight ahead. It has been taken down and no worn parts were found. Please publish diagram and adjustments.—Tracy L. Scofield, Millbrook, Ill.

There is always less wear at the angle positions than at the straight ahead position and a tight adjustment straight ahead would probably give a binding adjustment at the angles. It would be very difficult to determine whether the worm or sector is worn enough to cause trouble by simply examining them. To make a test to ascertain the condition of the parts work the steering wheel slightly when placed in the extreme angular position.

If the steering column moves up and down, loosen the clamping bolt and turn the nut down until all of the end play is eliminated. Then tighten the clamping bolt. If the lost motion of the steering wheel is still excessive, examine the cross tube and reach rod connections for wear, also steering arm as it may be that it is loose on the worm shaft. If this does not eliminate the trouble it is certain that the teeth on the worm wheel and worm gear are worn.

We are inclined to believe that the gear has been adjusted tightly when the car had its full weight on the ground and was in the straight ahead position with a consequent result that binding occurs when in this position. Binding may not occur at the angular position if the worm has been moved so that the worn section is now in use when the car is placed in an angular position. We have no diagram that can be used for reference, but if instructions are followed the root of the trouble can undoubtedly be located.

REGULATOR TROUBLE

Q—When the small wire that runs to the motor-generator on the 1916 Grant 6 is disconnected, the ammeter will show charge, but will not as long as this wire is connected. If the regulator cut-out points are held together the ammeter will not register. What is the trouble and what harm will be done if this wire is removed?—Fred A. Cork, Des Moines, Iowa.

The wire to which you refer is evidently the lead running from the shunt field of the generator to the regulator. When this wire is removed the generator will be charging the battery direct and the cutout will not be in operation. If the generator is allowed to run with the cutout out of operation the current generated will probably burn out the battery.

Fig. 5 shows the internal wiring and we advise checking the connections with this diagram to see that they are correct. Fig. 4 shows the complete wiring and it would be advisable to check this also. There is a possibility of a ground in the regulator circuit which causes the current to seek this passage of less resistance before getting to the battery.

POWER CURVES

Q—Publish power curve of an Oakland car, model 34-C.

2—Publish power curve of a model 34 Velie.

3—Publish power curve of a Studebaker light six.—Merlyn I. Hanchett, Lyme, N. Hamp.

1—See Fig. 6.

2—See Fig. 7.

3—A power curve of this engine is not available, but the engine develops about 40 hp. at 2400 r.p.m.

CAR AND ENGINE SPEEDS

In the April 14 issue of MOTOR AGE on page 43 we published some approximate figures regarding the engine and car speed of the Essex. A 32 by 4 cord tire has a circumference of approximately 8.64 ft. and will, therefore, turn 611.1 revolutions in one mile. With a gear ratio of 4 2/3 to 1 this works out allowing no slippage at 2851.3926 r.p.m. at 60 m.p.h.; 3136.5318 r.p.m. at 70 m.p.h. and 3307.6171 r.p.m. at 76 m.p.h. The Essex engineers claim that it is not an unusual thing for a stock Essex car properly looked after and in perfect tune, to exceed speeds of 70 m.p.h. both by time and measured distances as well as the indication on the speedometer.

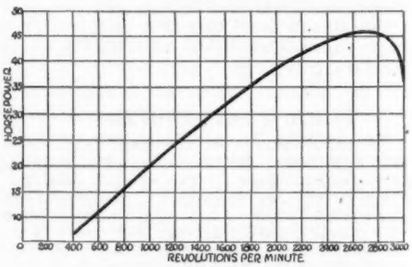


Fig. 6—Power curve of Oakland 34-C

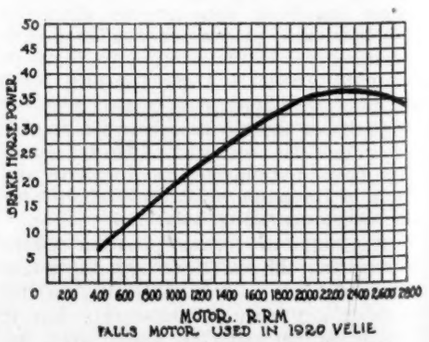


Fig. 7—Power curve of Velie 34

Wiring of Ignition System on 1913 Chalmers

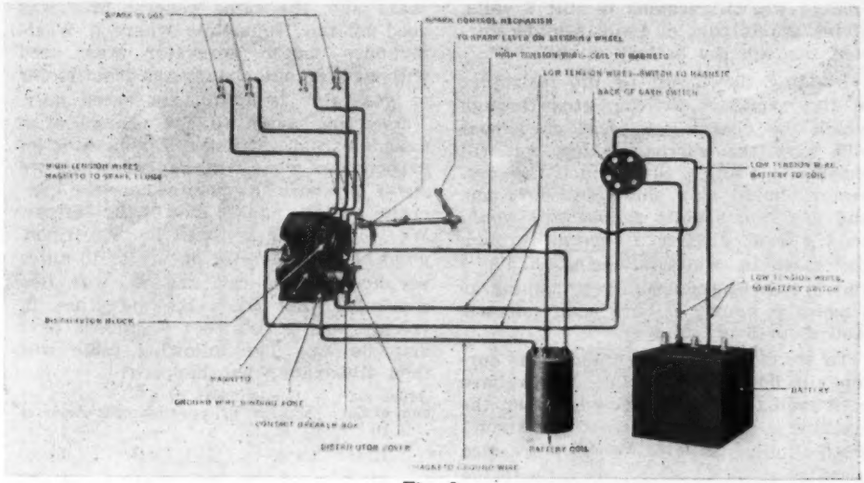


Fig. 8

Wiring of Lighting System on 1913 Chalmers

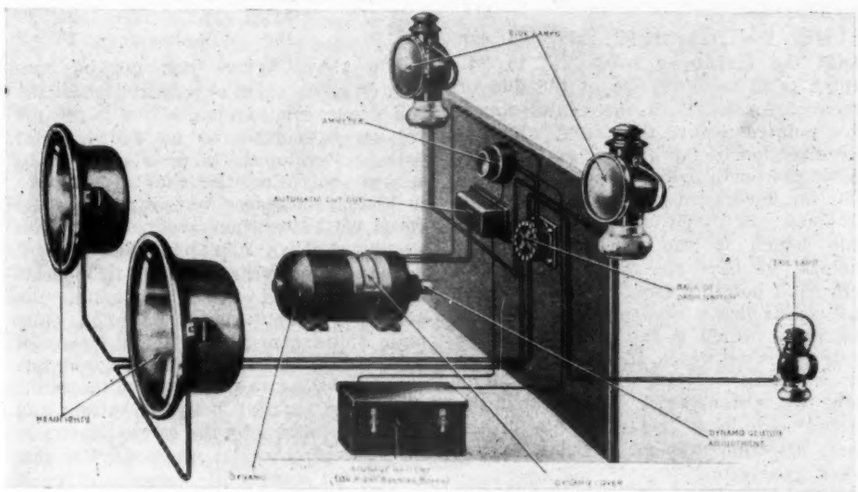


Fig. 9

1913 CHALMERS WIRING

Q—Publish wiring diagram of ignition, instrument board, lights, generator and horn connections of a 1913, Model 17 Chalmers four-cylinder car.—Square Deal Garage, Racine, Wis.

A pictorial diagram of the ignition wiring is shown in Fig. 8. A diagram of the Gray & Davis lighting system used on this model is shown in Fig. 9.

HUDSON RACING CARS

Q—Were the racing cars driven by Vail and Mulford in 1916 built from 1916 stock Hudsons? — Robert Morrison, Portland, Maine.

The Hudson racing car, driven by Ira Vail, and in which he was so successful, was originally a standard Hudson touring car, purchased from the Brooklyn, N. Y., agency, after having been used by it as a demonstrator for about three months. The Hudson Motor Car Co. has never built any special racing cars which were different from the standard product in any respects, save the weight of the reciprocating parts and size of valves.

A description of the car submitted to us by the Hudson Motor Car Co. is as follows: "The frame is standard in every respect except that 20 in. has been cut out of the middle just back of the transmission and the frame welded together again with reinforcements on the inside. The front and rear springs have been flattened out and leaves removed to suit the reduction in weight. The axles are standard with Timken bearings throughout and the gears used are stock gear supplied by the factory, the ratio being 2.61 to 1. This is the highest gear ratio that we supply.

"All parts of the engine, with the exception of pistons, are stock parts. The pistons, while of standard design, that is, having the same diameter wrist pin and with its bearing in the piston, are of Leavitt Magnalite metal. The camshaft and timing, the valve push rods, and valve springs are stock. The valve springs have been increased in pressure by introducing washers between the cylinder casting and the top of the spring.

"The Standard carbureter is used in connection with the standard cylinder block.

"The expert type of cylinder head in which the only difference is the metric spark plug holes is used for the obvious reason that there is less chance for plug trouble with this head, owing to the better cooling of the plug shell and a reduction in the size of the porcelain.

"The clutch, gear shaft, propeller shaft and steering gear are all standard Hudson equipment and without any change whatever.

"The engine is fitted with the standard Delco system throughout.

"The radiator is smaller than standard, and, of course, there is no fan behind it. The bonnet and body are special, being made out of sheet aluminum and are very light weight. The exhaust pipe is of a special type and comes outside the bonnet and body to facilitate cooling, as is common practice in racing cars."

SCRIPPS-BOOTH WIRING

Q—Publish diagram of Bijur motor generator circuit and explain internal connections on Scripps-Booth, 1915, model C. —J. A. Heisler, Richmond, Va.

The Bijur installation on the Scripps-Booth light cars is a single unit, single wire, 12 volt system with the positive side of the battery grounded. The electrical unit is chain driven from the crankshaft and the output when running as a generator is regulated by a combination of the third-brush and reversed series field methods. A switch on the dash controls the ignition and starting circuits. An internal wiring diagram which is self explanatory is shown in Fig. 10.

FIGURING CAR SPEED

Q—A model 34-B Oakland which has been run 1,200 miles runs oily. It does not foul the plugs but causes considerable smoking. Would Apex inner rings help or would it be necessary to install new rings? Would they have to be lapped in if I installed quick seating rings?

2—What type of thread is used on automobile bolts?

3—How can the speed of a car be determined when the speed of the engine, the gear ratio and the size of the tire is known?

4—Is there a device on the market that can be installed on the dash to indicate the speed of the engine?—Melvin Armstrong, Upland, Calif.

The fact that the engine exhausts considerable smoke does not necessarily mean that new rings are required. The smoking may be due to too rich a mixture or perhaps to the use of too much oil. It would be advisable to see that the crankcase is never more than full and that the carbureter is set properly. If the smoking is still present it might be advisable to make an examination of the pistons and rings to determine what condition they are in.

2—Many of the bolts used have the S. A. E. thread but undoubtedly other types of threads such as U. S. Standard, V, Whitworth and pipe threads are in use.

3—The speed of a car, excluding the slippage, can be found by determining how many revolutions the wheels make at a certain engine speed and then figuring the distance covered in a period of one hour. For instance, assume an engine speed of 2,000 r.p.m. and a gear ratio of 4 to 1, the car being equipped with 32 by 4 tires. During one revolution of the wheel the distance traveled is 32 times 3.1416 divided by 12 or 8.4609 ft. With the gear ratio 4 to 1 the wheel would make 30,000 revolutions per hour.

The distance traveled in the hour would be 253,827 ft. or 48.07 miles.

4—A tachometer can be installed that will register engine speed and can be purchased from any of the following companies:

Jones-Motrola, 29 W. 35th St., New York.

Nelson Instrument Co., 7 Elkins St., Boston, Mass.

Electric Tachometer Co., Perry Bldg., Philadelphia, Pa.

HOW THE ELECTRIC SYSTEM WORKS
ARTICLE VI

(Continued from page 33)

ing. It, therefore, happens that **whatever** causes a wire to move through a magnetic field is acting to set up a voltage in that wire.

In considering the action of motors, we think only of the torque effect of a wire carrying a current when acted upon by a magnetic field, the mutual action being to push the wire across the field, and it is on this principle that motors operate. However, as soon as the wires in the motor armature cause it to revolve, they begin to cut through the lines of force of the magnetic field and, according to our unvarying law, this produces a voltage. We then have the seemingly peculiar condition that a motor is a generator at the same time that it is running as a motor. The difference lies in this, however, that when running as a generator, the machine is producing a voltage **higher** than the battery causing it to take a charge, but when running as a motor it produces a voltage that is less than that of the battery and draws current from it.

Referring to Fig. 6, let us assume that when the armature turns at the rate of 600 r.p.m. that it generates 6 volts and that the battery voltage is exactly 6 also. Current will flow through the generator field windings as shown by the solid arrows, but the balance of voltage between generator and battery will result in neither a charge nor a discharge current flowing through the ammeter. When the generator is speeded up to about 700 r.p.m. the voltage generated will be about 7, while the battery voltage we will assume is still 6 volts, giving a difference of 1 volt sending current through the battery circuit.

Dividing the 1 volt by the resistance of the armature, wiring, etc., through which the charging current must pass will give the current which we will assume is 4 amp. Similarly if the generator should slow down to 500 r.p.m. and generate 5 volts the battery would send 4 amp. discharge current through the machine while motoring. This 5 volt pressure produced when running as a motor is known as back e.m.f (electric motive force or voltage).

To see clearly the direction of the current in both cases, solid arrows have been used for currents flowing when the machine is generating and dotted arrows when running as a motor. We are also considering, of course, that the machine continues to run in a right hand or clockwise direction, which it would continue to do, if driven by or connected to the engine.

Using the right hand rule, we can point the forefinger from "N" to "S" which is in the direction of the flux or lines of force. With the center finger now pointed toward the paper, which is the direction of the current as it passes under the north pole, we have the thumb pointing downward, which is the rotation assumed. Similarly using the left hand rule which is the one for checking motors, we have the fore finger of the left hand pointing from "N" to "S" and the center finger now pointing up from the paper which is the direction of the dotted arrows which show the direction of motoring current. The left thumb now points downward showing that the armature is now trying to run in the same direction that we forced it to run when generating.

The above principle is employed in motor generators, the North East system on Dodge cars being a good example, for the same machine first runs as a motor and cranks the engine, then as the engine speeds up it generates and charges the battery. A cutout is used on these machines, however. Some few years ago, the same general idea was used by the Hupmobile where a Westinghouse motor generator was used without a cutout, the change from motor to generator being due to speed only.

Referring again to the change of a machine from a motor to a generator let us consider what will happen when we speed up above the point where the generator voltage equals that of the battery. We will consider that the 500 r.p.m. point of the generator occurs at 10 miles per hour of the car, and we will also remember that when the difference in voltage was 1 volt that a current of 4 amp flowed. The following table will then illustrate what happens:

Miles per hour of Car	Gen. Voltage	Bat. Voltage	Difference	Amperes
10	5	6	—1	—4
12	6	6	0	0
14	7	6	1	4
16	8	6	2	8
18	9	6	3	12
20	10	6	4	16
22	11	6	5	20
30	15	6	9	36

The above figures can not be considered as an exact representation of the conditions existing but if the generator voltage is considered as the internal voltage developed, it does show in a general way that the charging current to battery increases very rapidly as the speed of the car increases, and becomes excessive above 20 m.p.h. The current flowing through the armature to the battery also has an effect of weakening the generator output, but the action of a plain shunt generator with no means of controlling the output at high speed, has characteristics as indicated in the table, and would burn up both the battery and its own windings by the excessive charging current it would produce. For this reason all automobile generators must have some means of controlling the generator output as the speed of the car varies. **Article VII next week.**

Wiring of Bijur System on 1915 Scripps-Booth

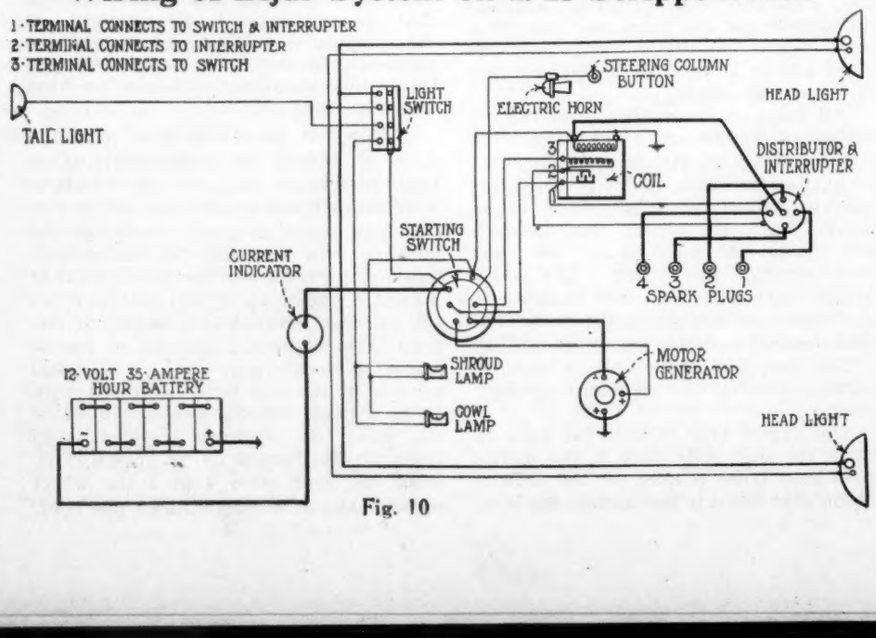


Fig. 10

CARBURETER FLANGES

In the April 28 issue of MOTOR AGE there appeared, in answer to certain questions on the Essex car, the statement that Hudson and Essex carbureters were equipped with standard and interchangeable flanges. As a matter of fact the carbureters are the same in principle but the flanges are not the same. Essex uses a three bolt flange and on the Hudson the carbureter is secured in place with two bolts. Consequently, it would be impossible to interchange these carbureters without providing a special fitting interposed between the engine block and carbureter.

In the matter of racing performance with Essex cars it is found to be the general experience of amateur and professional drivers that the standard gear ratios of 4-4/13 to 1 and 4-2/3 to 1 will obtain the best results in speed and accuracy for track work. Essex roadsters and touring cars equipped with standard gear ratios will easily attain speeds of 70 m.p.h.

Semi-Diesel Engines Being Developed by French Manufacturers for Automotive Vehicles

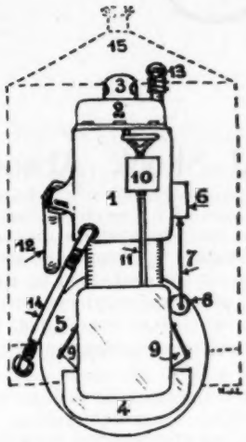


Fig 1—Front view of Delauny-Belleville semi-Diesel engine used on agricultural tractors. No spark plugs or carbureters are used on these engines

SOME attention is being paid by French manufacturers to the development of semi-Diesel engines not only for stationary work, but for use on trucks and agricultural tractors. Peugeot is working on this problem; Delaunay-Belleville has brought out an agricultural tractor with a semi-Diesel engine, and the S.M.I.M. Co. has a truck engine in operation.

The Delaunay-Belleville, which is built under Tuxham license, is a 16 hp. two-cylinder engine of 120 by 160 mm. bore and stroke, the general features of which are shown in Fig. 1. This drawing shows the cylinder with detachable head, surmounted by the hot bulb, with petrol pumps (6) on the side of the cylinder, operated by the eccentric (8) and the connecting rod (7).

This engine, which has been designed for truck and tractor use, is a two-stroke

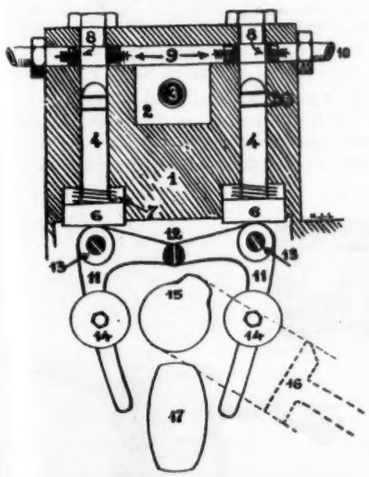


Fig. 4—A very peculiar fuel pump is used on the S. M. I. M. semi-Diesel engine. This pump is used in place of a carbureter and injects a small amount of fuel for each power stroke

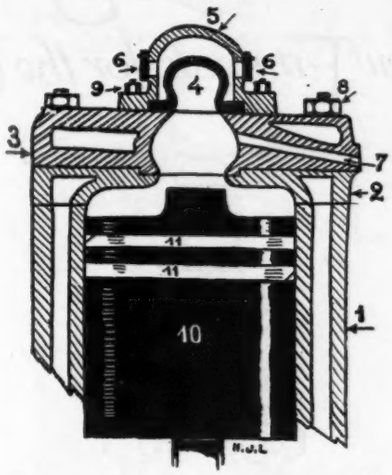


Fig. 2—Showing a cross sectional view of the semi-Diesel engine. The section marked "4" is the hot tube which performs the same duty as an ignition system

with crankcase compression, running normally at 650 revolutions, with a maximum of 800 revolutions, and throttling down to 400 revolutions. It has direct fuel injection by means of piston pumps, the body of which is in bronze with a hardened-steel piston. Engine control is by means of the automatic regulator acting on the output of the pumps; the tension of the regulator spring is variable from the driver's seat when the vehicle is in motion. Details of the Delaunay-Belleville engine by a section through the cylinder is given in Fig. 2.

The only semi-Diesel in use in France at the present time on an automobile truck is the twin-cylinder S.M.I.M. two-stroke, without crankcase compression. In this engine, the general arrangement of which is shown in Fig. 3, the fuel is injected at lower dead centre, and the mixture of air and kerosene is compressed in the working cylinder, thus distinguishing it from the Diesel, which compresses pure air.

Fig. 3 shows the cast iron cylinder (1)

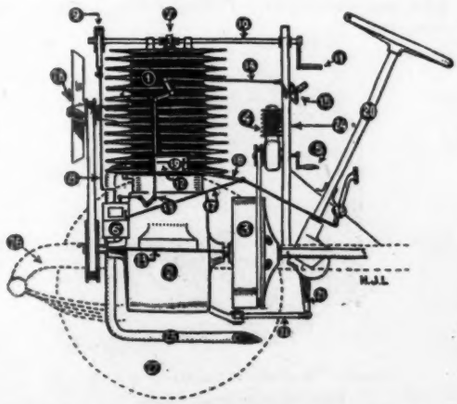


Fig. 5—Guilloux semi-Diesel engine designed for use on a truck

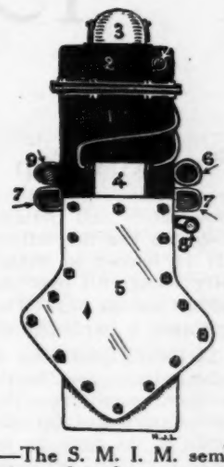


Fig. 3—The S. M. I. M. semi-Diesel engine is used on large motor lorries

with detachable head (2) surmounted by the hot bulb (3). The intake manifolds are shown at (7) and the exhaust at (9). The cylinders of this engine have a bore of 150 mm., 5.91 in., with a stroke of 170 mm., 6.69 in., the normal engine speed being of 1050 revolutions. Ignition is by means of hot bulb, with control by means of regulation of the output of the pumps, shown in Fig. 4. A truck with this engine is now being produced commercially and is giving satisfaction, notwithstanding the objection that it cannot be throttled down.

Fig. 5 shows the Guilloux single-cylinder semi-Diesel truck engine, the design of which is completed, but which has not yet been put into construction. This is a two stroke type with variable compression obtained by a mobile head fitted with compression rings, which can be raised or lowered in the cylinder by means of gearing and hand control (Fig. 6), so as to increase or decrease the compression space. No fuel pumps are used on this engine, these being replaced by a carbureter, the body of which is cast with the cylinder. The preliminary ignition is obtained electrically, and the engine is run normally by spontaneous ignition. Starting is provided by a small auxiliary motor.

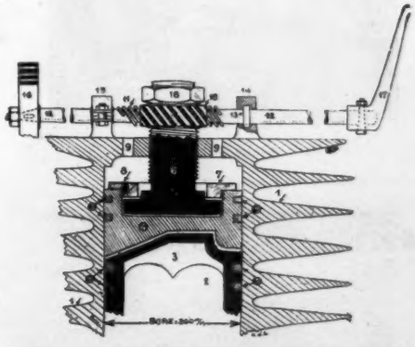


Fig. 6—The Guilloux semi-Diesel engine is of the variable compression type as shown by the movable cylinder head shown in this illustration

The Accessory Show Case

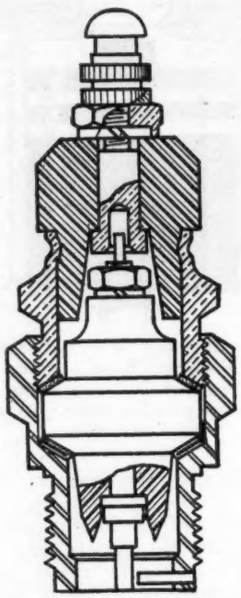
New Fitments for the Car

Protex-A-Cap

From the protection standpoint (against thefts of motometers and radiator caps) this Protex-A-Cap has the following advantage. It is locked in place by an eight tumbler lock with over 1,000 key changes and no master key. The action of the lock forces a hardened steel bolt into a slot in the adapter ring which is secured to the radiator neck by three cup point set screws, seated from inside the ring. These screws are forced tightly into the inside of the neck by means of an L wrench, furnished with each cap and when seated fits into the neck, so that twisting off is impossible. One style cap fits all radiators with screw caps with the exception of a few special models. The cap and ring are made of rust proof white metal, nickel plated. Price, $4.75. The Zinke Co., 1315 Michigan avenue, Chicago.

Niagara Water Circulating Pump

This water circulating pump is constructed of cast iron, brass and bronze and weighs about 8 lbs. net. It is easy to attach and is said to require no attention thereafter and does not require special fittings or bolts. By maintaining a uniform temperature, the efficiency of the engine is greatly increased resulting in the saving of gasoline, lubrication, and engines. It is designed for the Ford engine and is claimed to maintain uniform water temperature when operated at any speed in hot or cold weather. The Niagara Motor Cooler Co., Niagara Falls, N. Y.



Hi Power spark plug

Lafayette Visor

By means of a universal bracket with which this visor is attached, it can be applied to any open or closed car. The cover is so designed that it may be removed or placed without disturbing the frame or bracket. Covers of several different patterns of striped material can be obtained as well as solid black. Simple adjustment to any angle is provided for and these adjustments may be made from the seat. Price, complete, with one cover, $5. J. Horat Co., Lafayette, Ind.

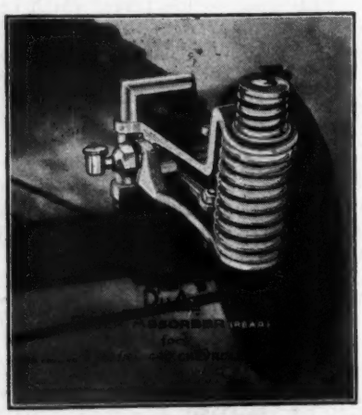
Du Al Shock Absorber

The Du Al shock absorber, as applied to the springs of a Chevrolet car, is designed and built to cushion the horizontal shock against the wheel and axle. The vertical movement cushioned by the original spring is entirely independent of the horizontal movement cushioned by the Du Al so that the combination of the two allows the axle to recede in any line or in the exact direction of the shock pressure, creating a smooth riding action. There are two coil springs used on each absorber; the lower spring compressing when the car strikes rough roads, then as the tension is released on the lower coil spring the upper coil spring receives or takes the tension. Price, $35. Du Al Mfg. Co., 1424 Nicollet ave., Minneapolis.

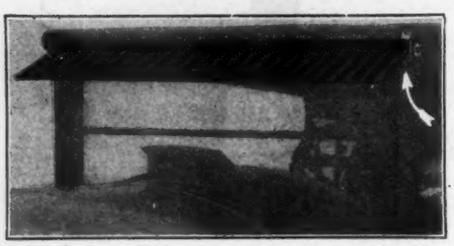
Hi Power Spark Plug

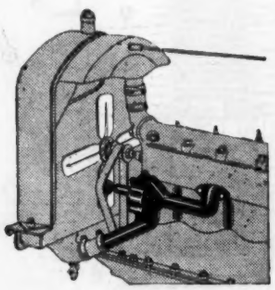
The insulator or core of the Hi Power spark plug is of a new patented design combining the features of both the petticoat and conical type of cores. The vital parts of this plug are entirely enclosed with and protected by an armor of steel. It is claimed that regardless of the compression of the engine this plug will fire perfectly. It is equipped with inverted copper-asbestos gaskets, preventing leak compression. The sparking points do not extend below the shell and are of nichrome ¼ in. long. They automatically adjust themselves to the proper gap required. It is claimed that the installation of Hi Power plugs will increase the mileage and make starting easy. Price $1.50—Protected Spark Plug Co., 3328 Olive St., St. Louis, Mo.

The Ford magneto attachment, manufactured by the Magneto Attachment Co., 3608 Park avenue, New York City, which was described and illustrated in the April 28 issue, is for the Fordson tractor and not for the Ford engine, as stated in the description published.

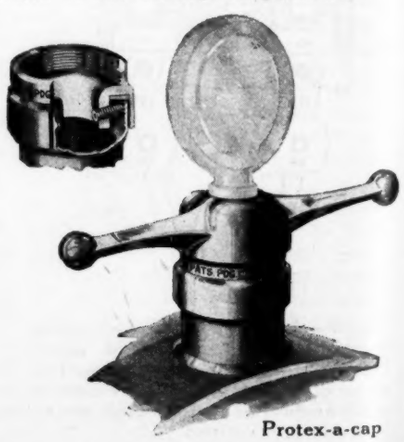


Du Al shock absorber





Above: Water circulating pump
Left: Lafayette visor



Protex-a-cap

Service Equipment
Time Savers for the Shop

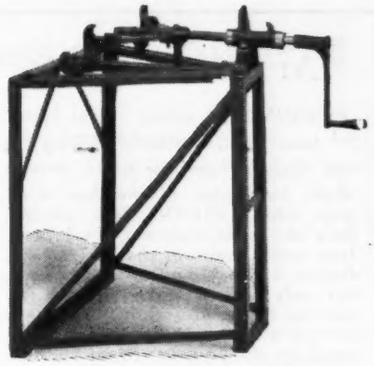
Universal Crankshaft Aligning Fixture

A device for aligning connecting rods and supporting any make or size of engine crankshaft so that the connecting rod bearings can be fitted and the rods and pistons tested for alignment has recently been placed on the market by the H & H Machine Co. of St. Louis, Mo. One of the most important operations in connection with the assembly of an engine is proper fitting of the bearings and making sure that pistons and connecting rods are lined so that the pistons will travel parallel with the cylinder bore and that the piston pins are in line with the axis of the crankshaft.

A device such as the one shown in the illustration will insure proper alignment before the assembly is completed and will prevent the necessity of taking the engine down again as is often the case where the alignment is not tested. The illustration shows the method of making the test. Note that each piston is squared on its own bearing which assures proper alignment after assembly in the engine. The universal crankshaft fixture complete with stand and one mandrel sells for $60. The extra mandrels sell for $3.75 and the B & S combination square for $3.90.

Marquette Rim Stand

The Marquette Manufacturing Co., 218 South Wabash street, St. Paul, Minn., have recently put on the market a tool designed to handle the expanding and contracting of all kinds and sizes of split rims. The stand is built of strong steel angles with reinforcements. A 1 in. spindle with a square thread is provided for doing the work. The gripping parts are made of malleable iron. The tool is prevented from buckling or the arms

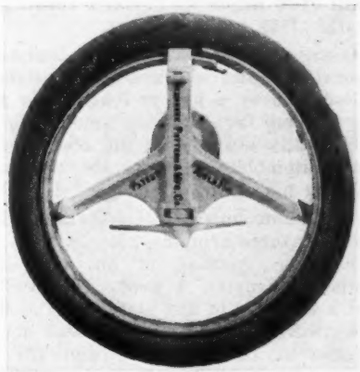


Marquette rim stand

from sliding by tracks or slides in which the arms travel. This is claimed to prevent damage or sprung rims. Price $30.

Zip Grinding Compound

Zip valve grinding compound is claimed to reduce valve grinding. It is a mixture of a hard, sharp abrasive with a non-lubricating chemical binder, contains no glass, grit emery or lubricants, and works with water. It is claimed to be non-freezing, non-drying and economical. Zip Mfg. Co., Denver, Colo.



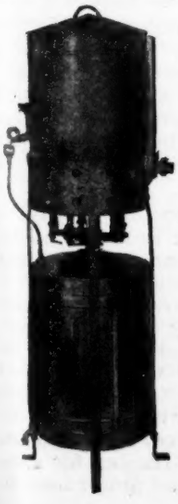
Milwaukee rim tool

Illinois Gage Iron Battery Steamer

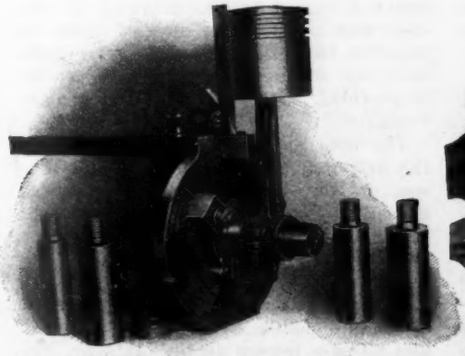
A new battery steamer made of heavy gage iron and built to support both still and storage tank is manufactured by the Illinois Battery Steamer Co., 607 Spencer street, Peoria, Ill. The boiler is 4 in. deep and 18 in. in circumference and has a 2 in. clean out plug with a scale and sediment flusher. The water is automatically controlled by an overflow which permits hot water to supply the boiling chamber after it has been in operation for about one-half hour. This overflow sets flush against the condenser, the condenser being 18 in. high and 18 in. in circumference, giving a large condensing surface. The distilled water storage tank which holds an average of 26 to 28 gal. of water sets directly beneath the burner. The steamer is provided with a water gage for determining the height of water in the tank and a brass faucet at the base permits removal of the water.

Milwaukee Rim Tool

Due to the rigidity of this tool it cannot be designed in a collapsible state and is therefore primarily intended for garage and service station use. It has a range to take in all sizes of rims for motor cars as well as the pneumatic type rim and it is claimed will open any split type rim. In opening a rim with this tool the entire rim slides around the prongs which hold the rim on the tool thus preventing the rim from being pulled or twisted out of shape. It is manufactured by the Milwaukee Pattern & Manufacturing Co., 1195 30th street, Milwaukee, Wis.



Left: Illinois battery steamer



H & H universal crankshaft support and aligning fixture, showing method of making test

Law in Your Business

By Wellington Gustin

At Your Service

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer, but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted to him.

Proceeding Against Signers of Protested Checks

A car with a broken Ford bearing was brought into our garage by a farmer. It needed a new spindle and wire in both wheels, the bill amounting to $12. This man gave us his check in payment and in about a week the check was returned, protested. If the property is mortgaged and there are no funds in the bank how can we obtain the amount due us? Can we remove the parts we installed or take the car should it be brought to the garage again? In another case A cashed a check at some garage and later the check was returned. The check was given in payment of wages, he was not the maker nor the signer of the check. Who can be proceeded against for recovery of the money paid out on this check the maker, or the endorser?—John Kruse, Aspinwall Garage, Aspinwall, Iowa.

If you did not extend credit to this farmer customer, and the check is evidence that you did not, then you should have replevined the car to get back the possession, immediately after you learned that the check was returned under protest. You have a common law lien in Iowa for work and repairs made on the automobile, but you must retain possession to enforce it.

Having willingly let a repaired automobile go back into the possession of its owner, one may not hold it for this repair bill when it comes again into his possession.

It is probable you could yet recover possession of the car by a suit in replevin, but it would not be practical at least to go get the parts except by process of law.

Regarding the second check. The garage owner may proceed against the signer, who is the maker of the check, as well as against all endorsers on the back of the check. Of course, the maker of the check is primarily and ultimately liable, but you may proceed against the others.

Sellers Lien Paramount to Garagekeepers Lien

Which lien comes first in the case of a mechanic's lien and title note on the same car in the state of Tennessee?—Triple Motor Service Co., Savannah, Tenn.

It appears that in Tennessee the mortgagee, if his mortgage is prior in time to the garagekeeper's lien, and the "title note," meaning the sellers' lien, is paramount to the subsequent garagekeeper's lien. This lien is subordinate, also, to that of one under a prior conditional sale.

DEATH FROM FAILURE TO KEEP PROPER LOOKOUT AHEAD IS "INVOLUNTARY MANSLAUGHTER"

AN indictment in two courts against John Kreuger was sustained in the Delaware Court after a former indictment on a lesser charge had been annuled. The second was for manslaughter for making a felonious and willful assault upon Raymond T. Hurd, causing his death. (111 A. 911.)

It was charged that the defendant while operating an automobile negligently failed to keep a proper lookout for persons upon the highway, and while so negligently engaged in the operation of the automobile, struck the deceased, causing his death.

Defendant sought to quash this indictment on three grounds, namely: (1) Because the running of an automobile without "keeping a proper lookout" is not a violation of any statute of the state (Delaware); (2) Because it was not an offense at common law; and (3) the charges were not described with sufficient particularity. The court said the real question raised by the pleading in this case was not whether the averment in question constitutes a statutory or common law offense but whether it would, if provided, constitute involuntary manslaughter.

The court was of the opinion that if the driver of an automobile kills a person on the highway because he was grossly negligent in not keeping a proper lookout, he would be guilty of the crime charged.

The court has charged the jury in more than one case that even though the driver of an automobile, at the time he struck and killed a person on the highway, was not violating the speed law, nevertheless, if he was guilty of gross negligence in operating his machine and such negligence was the cause of the death, the driver would be guilty of involuntary manslaughter. Further, the indictment described the offense with sufficient particularity when it charged that he caused the death of Hurd by running his automobile without keeping a proper lookout.

Mortgagee Has Prior Lien

If a car is covered by chattel mortgage and afterward the owner of the car incurs a bill of repairs on it, not paying for the repairs, who has first claim on the car, the mortgagee or the garageman making the repairs? What lien has the garagekeeper in Nebraska for repairs?—Manke Motor Co., Bloomfield, Nebr.

The mortgagee, having a chattel mortgage properly executed and acknowledged and recorded, prior to the lien for repairs, has first claim on the automobile in the state of Nebraska.

Further, your state gives the garage-owner an artisan's lien on a repaired automobile so long as he retains such car in his possession. (Revised Statutes of Nebraska, Section 3841.) This is the same as the common law lien.

By filing a statement with the county clerk where the work was done, or the car is kept, or the material was furnished, within 60 days after performing the work or furnishing the materials (which statement must be verified and describe the work done, or materials furnished and the car), the garageman is given a lien although he does not retain possession of the car. This lien is superior only to those liens created subsequent to the date of filing this garagekeeper's lien. Hence, a purchaser of a repaired car, without knowledge or notice of the rights of persons performing such work or furnishing repairs, has a prior right, where he purchased the car after the work was done or repairs furnished but before the required statement had been filed. Sections 3842 and 3843 Revised Statutes of Nebraska.

Note these are two distinct liens. The first lien permits only the retention of an automobile until the charges are paid. No statement of lien claim is required under it. In the second lien a statement is required and the lien is good only after filing of the lien claim in the county clerk's office.

Under the latter, possession may be retained, and the lien is treated in all respects as a chattel mortgage and may be foreclosed as a chattel mortgage.

The Automotive Repair Shop

Practical Maintenance Hints

Adjustable Press and Puller of Many Purposes

PRACTICALLY every shop has several heavy sledges which are used on every available occasion. This practice is not to be recommended as the resulting damage to parts is frequent and personal injuries occur when the sledge slips. The arbor press should be used if one is available or the conditions of the work will permit.

Most any shop will find an arrangement of press and puller as is shown in the sketch to have several desirable uses, and to prove a detail of shop equipment much more satisfactory and servicable than the heavy hammer, and more useful than a stationary press.

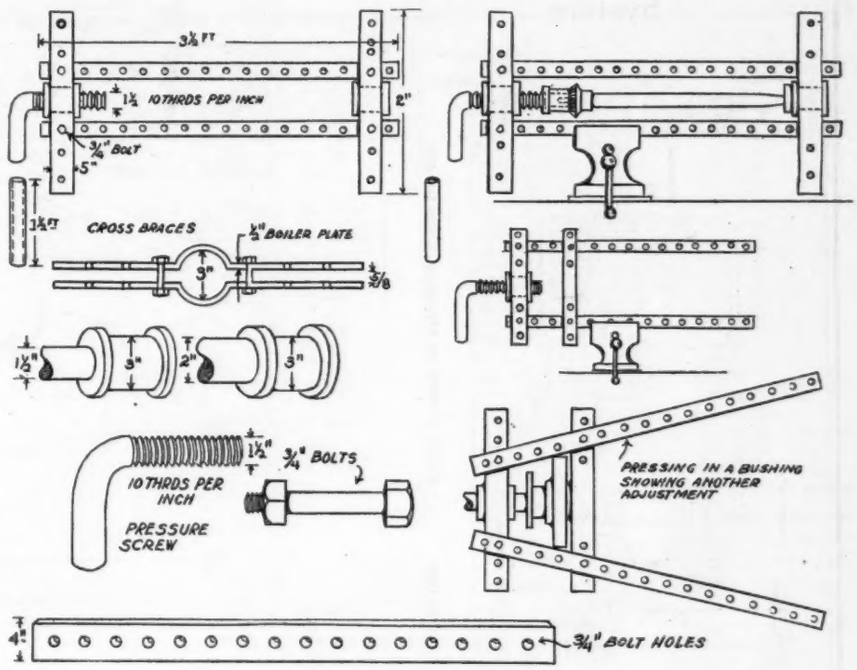
The fixture is portable and in consequence is useful in straightening car frames, bumpers, pulling steering posts or pulling off wheels.

The frame is made so that it is readily clamped in a vise in either a horizontal or vertical position. The details of this tool consist mainly of the perforated steel plates forming the frame. This is ½ in. boiler plate and the holes are drilled for ¾ in. bolts. The side frames are 3½ ft. long and 4 in. wide. The bolt holes are drilled of 5 in. apart.

The cross braces consist of two sections of ½ in. plate each, 2 ft. long and 5 in. wide. The upper cross brace is fitted with a threaded hub, which can be turned up from heavy bar stock of the steel hub of a wheel and can be turned down and threaded inside for this purpose. The lower brace has a similar center support but is not threaded. A drilled hole through this hub is about 2 in. in diameter which will accommodate the shafts while pressing off gears.

The screw is threaded to fit the upper brace, and is made from bar stock turned down from a steel axle about ½ in. in diameter. The width adjustability of the tool is of especial advantage and the parts are reversible so that the screw can be turned about and made to push where the parts are not too far apart.

With a fixture of this type in the shop the workmen soon become acquainted with its possibilities and adapt it to numerous uses.

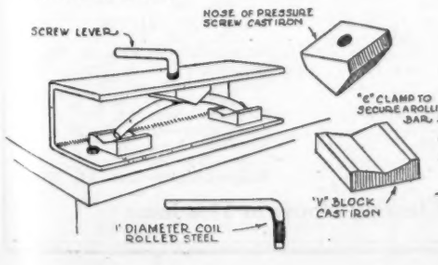


Above is shown an adjustable press and puller. It is portable and therefore useful in straightening frames, bumpers, pulling steering posts or pulling wheels

Steel Channel Makes Serviceable Straightening Fixture

A 5 ft. section of the 12 in. steel channel provides a serviceable feature for the repairshop in straightening front axles, shafts, truss rods, or other parts of the chassis. The upper face of the channel affords a hammering support for work which can readily be straightened out with a sledge, while its length is such to readily accommodate long brake rods, steering shafts, cross steering rods and similar parts. As is shown in the sketch a screw pressure lever and "V" blocks is used between the sides of the channel when a steady pressure is required to straighten drive shafts, axles, crankshafts, etc., making these exactly true.

The screw lever is made from a 1 in. diameter cold rolled steel and this engages a threaded hole in the upper edge of the channel. Two "V" blocks of cast iron for the part to rest in and a third block for the end of the screw with a guide in this for the screw are all the parts required. The channel is bolted down solidly to the edge of the bench to permit of attaching heavy "C" clamps to hold the larger shafts from turning over when these are being straightened.


SCREW LEVER
NOSE OF PRESSURE SCREW CAST IRON
"C" CLAMP TO SECURE A ROLLING BAR
"V" BLOCK CAST IRON
1" DIAMETER COIL ROLLED STEEL

At left is shown the use of a steel channel for odd jobs of straightening around the repair shop

Bearing Wrench

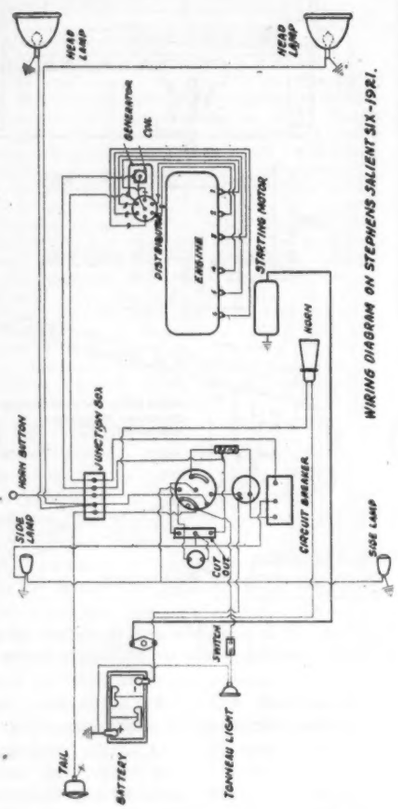
A good bearing wrench can be made by fastening an old steering wheel on a square piece of steel. The square shaft is for interchangeable sockets, and a thrust handle for the hand to spin them off, when nuts are loosened.

Useful Bearing Scraper

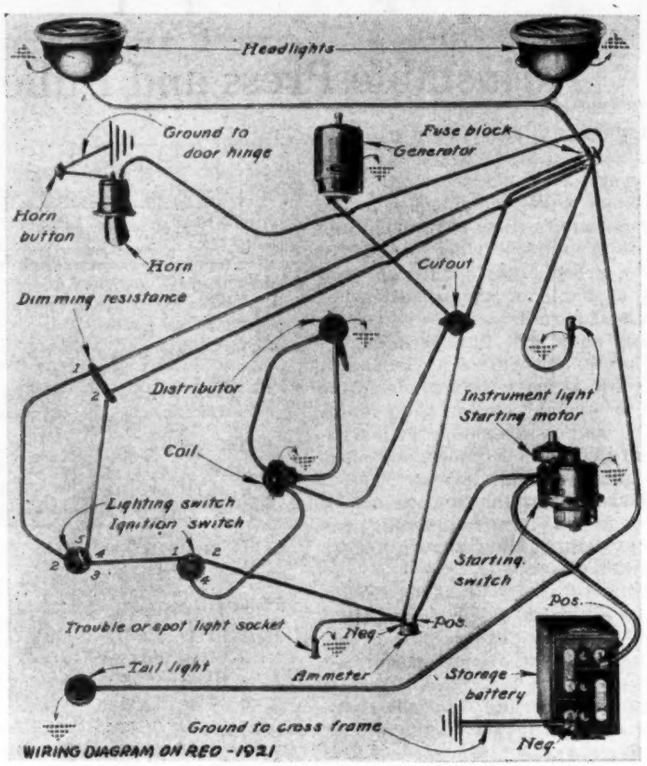
An old piston ring can be used as a bearing scraper and will work very well. As soon as it gets dull in one spot it should be moved around giving a very sharp edge which makes for speed and is less tiresome to the wrists.

Motor Age Weekly Wiring Chart No. 128

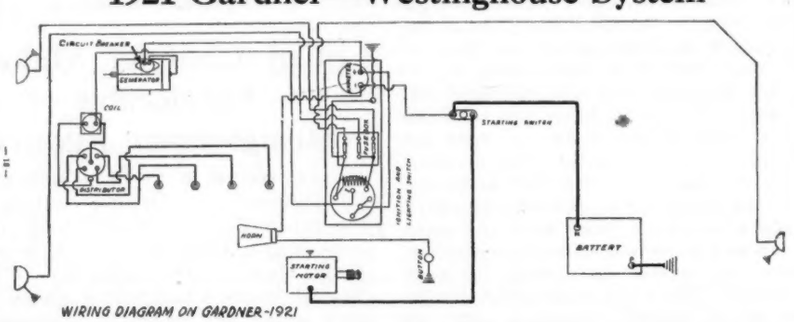
1921 Stephens—Auto Lite System



1921 Reo—North East System



1921 Gardner—Westinghouse System



Name of Car and Date on Which Wiring Diagrams Have Appeared in Previous Issues

Allen—Sept. 30, '20
American Beauty—Feb. 17, '21
Buick—Dec. 23, '20
Cadillac—Nov. 18, '20
Case—Oct. 7, '20; Feb. 17, '21
Chalmers—Feb. 24, '21
Cleveland—Feb. 24, '21
Cole—Jan. 20, '21; May 5, '21
Daniels—Feb. 17, '21; May 12, '21
Dorris—Dec. 9, '20; Feb. 24, '21
Elcar—Oct. 28, '20
Dec. 2, '20
Elgin—Oct. 14, '20
Elkhart—March 3, '20
Franklin—Dec. 2, '20
Gardner—April 14, '21
Grant—Nov. 25, '20; March 31, '21
Hudson—Jan. 13, '21
March 17, '21
Hupmobile—Feb. 3, '21
Jackson—March 17, '21
Jordan—March 10, '21
King—March 3, '21
Kissel—Oct. 21, '20
Apr. 28, '21
Klinekar—April 14, '21
Lexington—Dec. 16, '20
Locomobile—May 5, '21
McFarland—March 24, '21
Mercer—March 24, '21; May 12, '21
Mitchell—Jan. 6, '21; Apr. 21, '21
Moore—Nov. 11, '20
Moline-Knight—Nov. 4, '20
Monitor—March 31, '21
National—Dec. 16, '20; March 10, '21; May 12, '21
Oakland—March 24, '21
Oldsmobile—Apr. 21, '21
April 28, '21
Packard—Oct. 7, '20
March 31, '21
Paige—March 10, '21
Peerless—Nov. 18, '20
March 3, '21
Pierce-Arrow—April 21, '21
Premier—Feb. 10, '21
Reo—Feb. 10, '21
Roamer—Dec. 30, '20
Feb. 10, '21
Saxon—Oct. 21, '20
Dec. 30, '20
Scripps-Booth—Feb. 3, '21
Sheridan—Feb. 3, '21
Stearns—Nov. 4, '20
Jan. 13, '21; May 5, '21
Stephens—Sept. 16, '20
Studebaker—Oct. 29, '20
Templar—April 28, '21
Velie—Jan. 20, '21
Willys-Knight—Oct. 14, '20

Additional Wiring Diagrams May Be Found in the Readers' Clearing House in This Issue

Passenger Car Serial Numbers

Motor Age Maintenance Data Sheet No. 150

One of a series of weekly pages of information valuable to service men and dealers—save this page

PATERSON

Year	Model	Cyls.	Price	Serial Numbers
1912	G	4	$1600	4001-4425
	H	4	1850	
1913	45	4	.....	6001-6350
	47	4	1850	8001-8052
1914	33	4	1200	9300-9700
	32	4	1200	9010-9059
1915	6-48	6	1400	1000-1101
	4-32	4	1200	X100-X573
1916	6-42	6	995	301-1302
1917	6-45	6	.....	5001-6986
1918-19	6-46	6	.....	6869-9504
1920	6-47	6	.....	12001 up 12101 up

PATHFINDER

Year	Model	Cyls.	Price	Serial Numbers
1912	12	4	$1750	500-802
1913	13	4	2185	1000-1342
1914	14	4	2185	
	14	6	2750	1500-1716
1915	....	....	2222	
	....	....	2750	2002-2566
1916	Six	6	1695	
	Twelve	12	2475	2901-4175
1917	3-B	12	2750	8001-17525

Discontinued

Number on dash plate.

PEERLESS

Year	Model	Cyls.	Price	Serial Numbers
1912	33	4	$4300	12001-12900
	35	6	4000	121001-121296
	36	6	5000	122001-122439
	37	6	6000	123001-123068
1913	35	6	4300	131001-131251
	36	6	5000	132001-132386
	37	6	6000	120368-123123
1914	36	6	5000	142001-142589
	37	6	6000	143001-143058
1915	36	6	5000	152001-152100
	54	4	2000	DD101-DD2500
	55	6	2250	EE101-EE5000
1916	Series 1	8	1890	160001-169000*
1917	Series 2 & 3	8	1890	170001-179000
1918	Series 4	8	2340	230001 up

*To March 21

1919	Series 5	8	.....	260000 up
1920	Series 6	8	.....	

Since 1916 series models instead of yearly models adopted.

PIEDMONT

Year	Model	Cyls.	Price	Serial Numbers
1917	4-30	4	$1095	1-400
	6-40	6	1545	400-500
1918	4-30	4	1095	500-1000
	6-40	6	1545	1000-1200
1919	4-30	4	1235	1200-2500
	6-40	6	1685	2500-3000

After Dec. 15, 1919, number on main floor board.

PIERCE-ARROW

Year	Model	Cyls.	Price	Serial Numbers
1912	36 H. P.	6	$4000	32200-33200 9199-9201-57
	48 H. P.	6	5000	9259-9321, 9323-9522
	66 H. P.	6	6000	9524-42, 9544-9667, 9669-9684, 9686-9769, 9771-10000, 10002-8, 10010, 10012-19, 10021-26, 10028-35, 10037-58, 10060-1, 10064-5, 10077-8, 10083 10088, 10095-10105, 10122, 10126-7, 66298-66500
1913	38-C	6	4300	33301-34050
	48-B	6	5000	10301-11125
	48-D	6	5000	9543, 9668, 9685, 9770, 10001, 10009, 10011, 10059, 10062-3, 10066-76, 10079-82, 10084-87, 10089-94, 10106-9, 10111-12, 10115-16, 10118-19, 10121, 10123-25, 10128-32, 10137, 10139-40, 10159, 10165, 10187-8, 10197-8
	48-D2	6	5000	9200, 9258, 9322, 9523, 10020, 10027, 10036, 10110, 10113-4, 10117, 10120, 10133-6, 10138, 10141-9, 10150-3, 10154-8, 10160-4, 10166-86, 10189-96, 10199, 10200

PIERCE ARROW (Continued)—

Year	Model	Cyls.	Price	Serial Numbers
	66-A1	6	6000	66601-66800
1914	38-C2	6	4300	34101-34603 and 34047
	48-B2	6	5000	11201-12100 and 11100
	66-A2	6	6000	66900-66964
1915	38-C3	6	4300	34701-35450
	48-B3	6	5000	12301-13050
	6-A3	6	6000	67050-67150
1916	38-C3	6	4300	35601-36350
	48-B3	6	5000	13051-13650
	66-A3	6	6000	67050-67150
	38-C4	6	4300	36601-37605
	48-B4	6	5000	13901-14900
	66-A4	6	6000	67201-67405
1917	38-C4	6	4300	37701-38701
	48-B4	6	5000	15001-16000
	66-A4	6	6000	67499-67800
1918	48-B4	6	5000	16001-16400
	48-B5	6	6500	16401-17400
1919	48 H. P.	6	7750	511001-511375 512001-512375 513001-513300
	38 H. P.	6	7250	311001-311375 312001-312375
1920	38 H. P.	6	.....	31301 up
	48 H. P.	6	.....	51401 up 51501 up

Number on plate below left front door; also stamped on cross frame member just behind motor.

PILOT

Year	Model	Cyls.	Price	Serial Numbers
1912	40	4	$1800	400-500
1913	40	4	2000	
	50	4	2250	1400-1550
	60	6	2500	
1914	50	4	2500	1551 1621
	60	6	2785	
1915	55	6	1885	1700-1755
1916	6-45	6	1100	
	6-55	6	1685	1756-2070
	8-55	8	1785	
1917	6-45	6	1150	2071-2999
1918	6-45	6	1295	3000-3575
1919	6-45	6	1650	3575 up

Number on left frame horn.

PORTER (Previous to 1919 see F. R. P.)

Year	Model	Cyls.	Price	Serial Numbers
1919-20	46	4	....	101-519

PREMIER

Year	Model	Cyls.	Price	Serial Numbers
1912	4-40	4	$3700	
	6-60	6	4100	5000-7000
1913	6-40	6	3900	7000-9000
	6-60	6	4200	
1913½	6-48	6	3700	10000-10499
	6-49	6	3800–3900	10500-11999
1914	A	6	3900	12000-13000
1915	6-50	6	3700–3900	65150-1615000
1916	6-51	6	3900	
1917	6B	6	3200-3400	0001-2912
1918	6C	6	3200–3710	
1919	6C	6	3200–3400–3710	3501-4511
1920	6D	6	.....	

5001 up

1912 to 1916 inclusive, number left frame member, center and near step hanger.

1917 to 1919 inclusive, number under front cushion on left side, on right starting crank on front cross member, and on front spring hanger.

Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ace.....G	Guy..	6-3¼x5	123	32x4	$2975	$2975	....	$3680	$3680
Ace.....H	H-S..	6-3⅝x5	123	32x4	2975	2975	....	3680	3680
Ace.....L	H-S..	6-3¼x5	116	32x4	2260	2260	....	....	....
Allen.....Series 43	Own..	4-3½x5	110	32x4	‡1395	1395	....	....	2395
Ambassador.....R	Cont..	6-3½x5¼	136	33x5	....	†4500	$4500	....	6500
Amco.....1921	H-S..	4-3½x5	114	31x4	....	....	....	....	....
American.....C	H-S..	6-3¼x5	127	32x4	2395	2395	2475	....	3495
Anderson.....Series 40	Cont.	6-3¼x4½	120	33x4	2195	1795	1845	2795	2795
Apperson.....8-21-S	Own..	8-3½x5	130	34x4½	....	†3500	3500	4500	4500
Apperson...Anniversary	Own..	8-3½x5	130	34x4½	....	†4250	4250	....	....
Auburn.....6-39	Cont..	6-3¼x4½	120	33x4	1745	1695	†1695	2795	2795
Beggs.....20T	Cont..	6-3¼x4½	120	33x4	1885	1885	....	2785	2885
Bell.....4-32	H-S..	4-3½x5	114	31x4	....	1495	....	....	....
Bell.....6-50	H-S..	6-3¼x5	124	32x4	....	1695	....	....	....
Birch Super-Four	H-S..	4-3½x5	117	33x4	1345	1345	†1395	2295	2295
Birch Light Four	LeR..	4-3½x4½	108	30x3½	1195	1195	....	....	....
Birch Light Six	H-S..	6-3¼x5	117	33x4	1695	1695	....	....	....
Bour-Davis.....21S	Cont.	6-3½x5¼	126	33x4½	†2585	†1745	2585	2495	2495
Brewster.....91	Own..	4-4 x5½	125	32x4½	†7900	9000	....	....	10500
Briscoe.....4-34	Own..	4-3⅝x5	109	31x4	1285	1285	....	1885	1885
Brook.....S-21 A	Own..	2-3½x3½	60	28x3	395	....	....	....	....
Buick.....21-44-S-6-7	Own..	6-3⅜x4½	118	33x4§	1795	1795	....	2585	2895
Buick.....21-48-9-50	Own..	6-3⅜x4½	124	34x4½	....	....	2665	2985	3295
Bush.....E C 4	Lyc..	4-3½x5	116	33x4	....	1245	....	....	....
Bush.....E C 6	Rut..	6-3½x5	116	33x4	....	1575	....	2050	2150
Cadillac.....59	Own..	8-3½x5½	125	34x4½	3790	†3790	....	....	4950
Carroll.....6	Dues..	6-3½x5	132	35x5	....	....	3940	....	5190
Carroll.....6	Dues..	6-3½x5	128	....	3985	3985	....	....	....
Case.....V	Cont..	6-3½x5¼	128	....	3185	3185	....	....	....
Chalmers.....6-30	Own..	6-3¼x4½	126	34x4½	....	†2650	2650	3400	3750
Chalmers.....6-30	Own..	6-3¼x4½	117	32x4	1795	1795	1945	2595	2745
Chalmers.....6-30	Own..	6-3¼x4½	122	33x4½	....	....	1945	....	....
Champion.....Tourist	Lycom	4-3½x5	113	32x3½	....	1250	....	....	....
Champion.....Special	H-S..	4-3½x5	118	32x4	†1595	1595	....	....	....
Chandler.....Six	Own..	6-3½x5	123	33x4	1930	†2010	1930	2930	3030
Chevrolet.....490	Own..	4-3½x4	102	30x3½	635	645	....	1155	1195
Chevrolet.....FB	Own..	4-3½x5¼	110	33x4	1320	1345	....	2075	2075
Cleveland.....40	Own..	6-3 x4½	112	32x4	1465	1465	....	2375	2475
Climber Four	H-S..	4-3½x5	117	....	1550	1550	....	....	....
Climber Six	H-S..	6-3¼x5	125½	32x4½	2750	2750	....	....	....
Cole.....870	Nort..	8-3½x4½	127	33x5	3250	†3250	3250	4250	4450
Columbia.....D-C&CS	Cont..	6-3¼x4½	115	32x4	1945	1795	1995	2895	2895
Comet.....C-53	Cont..	6-3½x5¼	125	33x4½	....	2350	2450	....	3650
Commonwealth.....44	H-S..	4-3½x5	117	32x4	....	1595	....	....	2465
Crawford.....21-6-40	Cont.	6-3½x5¼	122½	32x4	3000	3000	....	....	4500
Crow-Elkhart.....L63-65	Lyc..	4-3½x5	117	32x3½	†1295	1295	....	....	....
Crow-Elkhart.....S63-65	H-S..	6-3¼x5	117	33x4	†1545	1545	....	....	2395
Cunningham.....V-4	Own..	8-3⅜x5	142	35x5	33x5	....	....	....	....
Daniels.....D-19	Own..	8-3½x5½	132	34x4½	‡5350	†5350	5350	6250	6950
Davis.....61-67	Cont.	6-3¼x4½	120	33x4	†1995	1895	†2150	2795	2795
Dispatch	....	4-3⅜x5	120	34x4	1290	1350	1350	1525	1575
Dixie Flyer.....H-S-10	H-S..	4-3½x5	112	32x4	1595	1595	....	2570	2570
Dodge Brothers	Own..	4-3⅞x4½	114	32x3½	1235	1285	....	1900	2150
Dorris.....6-80	Own..	6-4 x5	132	33x5	....	†4785	4785	5800	6690
Dort.....17-12	D-Ly	4-3½x5	108	31x4	1215	1215	....	1865	1995
Dupont.....A	Own..	4-3½x5½	124	32x4½	3400	†3400	....	....	4900
Elcar.....K-4	Lyc..	4-3½x5	117	33x4	1300	1300	....	....	....
Elcar.....7-R	Cont.	6-3¼x4½	117	33x4	‡1700	1700	....	2500	2600
Elgin.....K-1	Falls.	6-3¼x4¼	118	33x4	†1895	1775	....	2795	2795
Essex	Own..	4-3⅜x5	108½	32x4	1595	1595	....	2100	2450
Fergus.....S-5-21	Own..	6-3¼x5	126	32x4½	....	Chassis Price		8500	....
Ferris	Cont.	6-3½x5¼	130	32x4½	3350	....	*3350	....	4100
Ford.....T	Own..	4-3⅜x4	100	30x3½	395	440	....	745	795
Franklin.....9-B	Own..	6-3¼x4	115	32x4	2700	2800	†2750	....	3850
Friend.....Four	Own..	4-3¼x4½	112	32x3½	1285	1285	....	1985	2085
Globe.....B-10	Supre.	4-3⅜x5	115	32x4	....	....	....	....	....
Grant.....Six	Own..	6-3½x4½	116	32x4	1550	1550	....	2450	2450
Gardner.....G	Lyc..	4-3½x5	112	32x3½	‡1195	1195	....	....	2145
Halladay.....21	Rut..	6-3½x5	116	33x4	....	2285	....	....	....
Handley-Knight	Kn'ht.	4-4⅛x4½	125	32x4½	....	....	2985	....	4185
Hanson Six.....60	Cont.	6-3¼x4½	121	32x4	2185	2185	†2285	....	3165
Hanover Light	Own..	2-3½x4	90	28x3	345	....	....	....	....
Harroun.....A-A-2	Own..	4-3⅜x5¼	106	30x3½	....	1195	....	....	....
Hatfield.....A-42	H-S..	4-3½x5	115	32x4	1695	1695	....	....	2595
Haynes.....47	Own..	6-3½x5	132	34x4½	3500	†2935	2935	....	4250
Haynes.....50	Own..	6-3½x5	121	33x4	....	1985	....	....	....
Haynes.....48	Own..	12-2⅞x5	132	34x4½	4200	†3635	3635	....	4950
Huffman.....R	Cont..	6-3¼x4½	120	32x4	1795	1795	....	....	2775
H.C.S	Weid..	4-3⅝x5½	120	32x4½	2925	†2975	....	3650	....
Holmes.....Series 4	Own..	6-3½x4¾	126	34x4½	†3350	....	3350	4250	4550
Hudson Super 6	Own..	6-3½x5	126	34x4½	†2400	....	2400	3275	3400
Hupmobile.....Series R	Own..	4-3¼x5½	112	32x4	1685	1695	....	2725	2800
Jackson.....638	Cont..	6-3¼x4½	121	32x4½	†2685	1950	....	3760	3760
Jordan.....M	Cont..	6-3¼x4½	120	32x4	2250	2250	2475	3300	3300
Jordan.....F	Cont..	6-3½x5¼	127	32x4½	....	....	2875	....	....
Kelsey.....GF	Own..	6-3¼x4¼	118½	32x4	1800	1800	....	2700	2700
Kenworthy.....8-90	Own..	8-3 x5¼	130	32x4½	5000	5000	5250	6000	6000
Kessler.....K	Own..	4-3¾x3¾	117	32x4	....	1995	....	....	2445
King.....J	Own..	8-3 x5	120	32x4½	2740	†2725	*2725	....	4035
Kissel.....45	Own..	6-3½x5½	124	32x4½	3475	†3475	2775	4275	4275
Kline Kar.....6-55-K	Cont.	6-3¼x4½	121	33x4	2290	2290	2290	3250	3290
Kurtz Automatic.....A	H-S..	6-3½x5	122	32x4	....	2250	....	....	3000
LaFayette.....134	Own..	8-3½x5¼	132	33x5	5625	5625	5625	7200	7400
Leach.....21-A-B&C	Cont..	6-3½x5¼	128	32x4½	‡5700	5200	5700	....	....
Lexington.....Series S	Cont..	6-3¼x4½	122	32x4	....	2285	....	3250	3350
Lexington.....Series T	Anst.	6-3¼x4½	128	32x4½	....	....	2985	....	4250
Liberty.....10-C	Own..	6-3½x5	117	32x4	1795	1795	†1885	2825	2850
Lincoln	Own..	8-3⅝x5	130	33x5	4600	4600	4600	5750	6000
Locomobile	Own..	6-4½x5½	142	35x5	....	†8600	8600	....	....
Lone Star	Lyc..	4	....	....	....	....	....	....	....
Lorraine.....21-T	H-S..	4-3½x5	114	32x4	1665	1665	....	2590	2590

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Maibohm.....B	Own..	6-3½x4¼	116	32x4	‡1575	$1575	†1750	$2395	$2395
Marmon.....34	Own..	6-3⅜x5⅛	136	32x4½	4185	†3985	3985	4875	5275
Maxwell.....25	Own..	4-3⅝x4½	109	30x3½	995	995	....	1595	1695
McFarlan.....1921	Own..	6-4½x6	140	33x5	6300	†6300	6300	7500	7500
Mercer.....Series 5	Own..	4-3¾x6¾	132	32x4½	4500	†4500	*4500	5700	6200
Merit	Cont..	6-3¼x4½	119	32x4	2245	†2245	....	....	....
Meteor.....R&RR	Dues..	4-4¼x6	129	32x4½	5500	5500	....	....	....
Metz.....M6	Rut..	6-3½x5	120	32x4	1995	1995	....	2795	2895
Mitchell.....F-40	Own..	6-3½x5	120	33x4	‡1750	1750	†1950	2800	2900
Mitchell.....F-42	Own..	6-3½x5	127	33x4	....	....	1995	....	....
Moller.....A	Own..	4-2⅞x4	100	27x3½	2000	....	....	....	....
Monitor.....B50-52	Cont..	6-3½x5	121	33x4	....	1850	....	....	....
Monroe.....S-9 & 10	Own..	4-3¼x4½	115	32x3½	1440	1440	....	....	....
Monroe.....S-11 & 12	Own..	4-3¼x4½	115	33x4	....	....	....	2400	2500
Moon.....6-48	Cont..	6-3¼x4½	122	32x4	2285	2185	2685	3185	3185
Murray-Mac Six	Own..	6-3½x5¼	128	34x4½	4250	4250	4250	....	....
Nash.....681-7	Own..	6-3¼x5	121	33x4	1695	1695	†1850	2650	2895
Nash.....682	Own..	6-3¼x5	127	34x4½	....	....	1875	....	....
Nash Four.....41-4	Own..	4-3¼x5	112	32x3½	1395	1395	....	1985	2185
National Sextet.....BB	Own..	6-3½x5¼	130	32x4½	3750	†3750	3750	4900	4950
Nelson.....D	Own..	4-3½x4¾	104	32x4	....	1900	....	....	....
Noma.....1C	Cont..	6-3¼x4½	128	32x4½	3000	3200	....	....	4450
Northway	Own..	6-3½x5¼	128	33x5	4200	*4200	6000	5600	5400
Norwalk.....430-KS	Lyc..	4-3½x5	116	32x3½	....	1285	....	....	....
Oakland.....34-C	Own..	6-2⅞x3¾	115	32x4	1145	1145	....	1815	1815
Ogren.....6-60	Own..	6-3½x5¼	134	33x5	†3850	3750	3900	5000	5400
Oldsmobile.....43-A	Own..	4-3⅞x5¼	115	32x4	†1445	1445	....	2145	2145
Oldsmobile.....37A	Own..	6-2⅞x3¾	112	32x4	†1450	1450	....	2145	2145
Oldsmobile.....46	Own..	8-2⅞x3¾	122	33x4½	....	†2100	2100	....	3300
Oldsmobile.....47	Own..	8-2⅞x3¾	115	32x4	....	†1695	....	2395	2395
Overland.....4	Own..	4-3⅝x4	100	30x3½	895	895	....	1425	1475
Packard.....Single-Six	Own..	6-3⅝x4½	116	33x4½	2975	2975	....	4150	4250
Packard.....Twin Six	Own..	12-3 x5	136	35x5	6000	*6000	6000	8200	8450
Paige.....6-42	Own..	6-3½x5	119	32x4	1795	1795	....	2600	2720
Paige.....6-66	Cont..	6-3¾x5	131	33x4½	†2995	....	2895	3775	3850
Pan.....A	Own..	4-3½x5	108	33x4	....	1500	....	....	....
Pan American.E&F-6-55	H-S..	6-3¼x5	121	33x4	2250	2250	....	....	....
Parenti.....1921	Own..	8-2¾x4¼	125	32x4	....	2000	....	....	3000
Paterson.....650	Cont.	6-3¼x4½	120	33x4	....	1895	1925	2895	2895
Peerless.....56-S-7	Own	8-3¼x5	125	34x4½	....	†2990	2990	3680	3950
Peters	Own	2-3½x3⅝	90	28x3	385	....	....	....	....
Piedmont.....4-30	Lyc..	4-3½x5	116	32x3½	....	1395	....	....	....
Piedmont.....6-40	Cont.	6-3¼x4½	122	32x4	....	1795	....	....	....
Pierce-Arrow	Own..	6-4 x5½	138	35x5	8000	†7500	7500	8500	9000
Pilot.....6-50	H-S..	6-3¼x5	126	32x4½	2285	2285	2335	3600	3600
Porter	Own..	4-4¾x6¾	142	35x5	6750	Chassis Price		....	....
Premier.....6-D	Own..	6-3⅝x5½	126¾	33x5	4600	†4600	4600	5600	5100
Premocar.....6-40 A	Falls.	6-3½x4¼	117	32x3½	....	1295	....	....	....
Raleigh.....A-6-60	H-S..	6-3¼x5	122	32x4½	‡2750	2750	....	3600	3700
Ranger.....A-20	Own..	4-3⅝x5	116	32x4	....	....	....	....	....
R & V Knight.....R	Own..	4-3¾x5	116	32x4	....	2150	....	2850	2950
R & V Knight.....J	Own..	6-3½x4½	127	32x4½	3350	†3350	3350	4000	4200
Reo.....T-6	Own..	6-3⅞x5	120	33x4	1850	1850	....	2700	2750
Revere.....C	Dues.	4-3⅝x6	131	32x4½	4850	4650	†4650	....	6500
Roamer.....6-54-E	Cont.	6-3½x5¼	138	32x4½	....	....	....	....	....
Romer	Cont..	6-3¼x4½	120	32x4	....	....	....	....	....
Rock Falls.....14000	Cont..	6-3¾x5	132	35x5	....	....	....	....	....
Rolls-Royce	Own..	6-4½x4¾	143½	33x5	U. S.	Chassis Price		11750	....
Saxon.....125	Own..	4-3⅝x5	112	32x4	....	1675	....	2475	2475
Sayers Six.....DP	Cont.	6-3¼x4½	118	33x4	2495	2195	....	....	3295
Scripps-Booth...B-39-42	Nort.	6-2⅛x4¾	115	32x4	‡1545	1545	....	2215	2295
Seneca.....L & O	LeR..	4-3⅝x4½	108	30x3½	1185	1185	....	....	....
Severin.....Six	Cont.	6-3½x5¼	122	33x4	1485	1485	....	2100	2250
Severin.....Six	Cont.	6-3½x5¼	122	33x5	2550	2550	2550	3250	3350
Sheridan.....4	Nort.	4-3½x5¼	116	33x4	1685	1685	....	2565	2765
Sheridan.....8	Nort.	8-3½x4½	132	33x5	....	....	....	....	....
Skelton.....35	Lyc..	4-3½x5	112	32x3½	1295	1295	....	....	....
Southern Six.....660-2	H-S..	6-3¼x5	127	32x4½	2875	2875	2995	....	....
Standard.....J	Own..	8-3¼x5	127	34x3½	3400	†3400	3400	4500	4500
Stanley Steamer	Own..	2-4 x5	130	34x4½	....	3950	2950	5650	5775
Stanwood Six	Cont.	6-3¼x4½	118	33x4	2050	2050	....	2950	2950
Stearns.....SKL4	Own..	4-3⅞x5⅝	125	34x4½	2550	2450	2675	3400	3700
Stephens.....90	Own..	6-3¼x4½	122	33x4½	2400	†2400	2400	3400	3400
Stevens Duryea.....E	Own..	6-4⅞x5½	138	35x5	8500	†8000	8000	9500	9500
Studebaker.....EJ-40	Own..	6-3¼x4½	112	32x4	©1850	1485	....	....	2150
Studebaker.....EH-50	Own..	6-3½x5	119	32x4	1750	1750	††1750	2650	2750
Studebaker.....EG-60	Own..	6-3⅞x5	126	33x4½	....	....	2150	....	....
Stutz	Own..	4-4½x6	130	32x4½	3900	†4000	*4000	5500	....
Templar.....A-445	Own..	4-3⅝x5½	118	32x4	2885	2885	†2885	3785	3785
Texan.....A-38	Lyc..	4-3½x5	115	33x4	1195	1195	....	....	....
Texan.....C-12	H-S..	4-3½x5	115	33x4	1350	1350	....	....	....
Tulsa.....E-1-2-3	H-S..	4-3½x5	117½	33x4	1385	1385	....	....	....
Velie.....48	Cont.	6-3¼x4½	115	32x4	1885	1885	†2200	2885	2885
Velie.....34	Falls.	6-3⅛x4¼	112	32x3½	1485	1485	....	....	2485
Vogue.....6-55	H-S..	6-3¼x5	124	32x4	....	2285	2360	3050	3050
Vogue.....6-66	Cont.	6-3½x5¾	124	33x4½	....	2485	2560	3250	3250
Washington	Fal's.	6-3¼x4¼	114	32x4	....	1685	....	....	....
Wasp.....2611	Wisc.	4-4¾x5½	132	33x5	....	†6500	....	....	....
Westcott.....C-48	Cont.	6-3½x5¼	125	32x4½	....	2990	2990	....	4590
Westcott.....C-38	Cont.	6-3¼x4½	118	33x4	2290	2290	....	3390	3390
Wharton.....A	Curt..	8-4 x5	136	34x4½	....	†4885	4885	....	....
Wills-Sainte Claire	Own..	8-3¼x4	121	32x4½	3275	3200	....	....	....
Willys-Knight.....20	Own..	4-3⅝x4¾	118	33x4	2195	2195	....	2845	2945
Winther.....61	H-S..	6-3¼x5	120	32x4½	....	....	....	....	....
Winton.....25	Own..	6-3¾x5¾	132	35x5	4600	†4975	4600	5950	†5950

*—6-passenger. †—4-passenger. ‡—3-passenger. ©—Special Body.

Engine Make: Cont—Continental. D.Ly—Dort Lycoming. Dues.—Duesenberg. GBS—Golden, Belknap & Swarts. H-S—Herschell-Spillman. Lyc—Lycoming. Nort—Northway. Rut—Rutenber. Tee—Teetor. Wal—Walther. Wisc—Wisconsin. Weid—Weidely. LeR—Lerci. Curt—Curtiss. §—Model 47—34x4½ Tires.

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason, R	1	$2260	3¾x5½	36x3½	36x5	W
Acason, RB	1½	2485	3¾x5½	36x3½	36x6	W
Acason, H	2½	3295	4½x5¾	36x4*	36x4d*	W
Acason, L	3½	4295	4½x5¾	36x5*	36x5d*	W
Acason, M	5	5250	5 x6¼	36x6	40x12	W
Ace, C	1½	2750	3¾x5½	34x3½*	34x5*	W
Ace, A	2½	3450	4¼x5½	36x4*	36x7	W
Ace	3	3650	4¼x5½	36x6	36x8	W
Acme, B	1	2175	3¾x5	34x3½	34x5	W
Acme, F	1½	2475	3¾x5	34x3½	34x5	W
Acme, A	2	3050	4¼x5¼	36x4	36x7	W
Acme, C	3½	4050	4½x5½	36x5	40x10	W
Acme, E	5	5150	4¾x6	36x6	40x12	W
Acme, G	¾	1790	3¾x5	35x5†	35x5†	W
Akr'nMulti-Trk	20	2485§	4 x5¼	34x5	34x5	B
All-Power, C	3½	5800	4½x6	36x7	36x10	W
All-American, B-1	1	1795	3½x5	32x4	32x4	I
All-American C-1	1½	2195	3½x5	34x4	34x5	I
American, 25	2½	3575	4 x6	36x4*	36x4d*	W
American, 40	4	4575	4½x6	36x5*	36x5d*	W
Apex, G	1	1675	3¾x5	33x5†	33x5†	I
Apex, D	1½	1915	3¾x5½	34x3½	34x4	I
Apex, E	2½	2695	4¼x5½	36x4	36x7	I
Apex, F	3½	3975	4½x6	36x5	36x10	I
Armleder, HW	2½	....	4¼x5½	36x4*	36x7*	W
Armleder, KW	3½	....	4½x6	36x5	36x5d	W
Armleder, 20	1	....	3¾x5¼	34x3½*	34x5*	W
Atco, B	1½	....	3¾x5¼	34x5†	36x6*	I
Atco, B1	1½	....	3¾x5¼	34x5†	36x6†	I
Atco, A	2½	....	4¼x5½	36x4†	36x8*	W
Atlas, M.D	1	....	3½x5	32x4½†	32x4½†	W
Atterbury, 20R	1½	2775	3¾x5	34x3½	34x5	W
Atterbury, 7CX	2½	3375	4½x5¼	36x4	36x4d	W
Atterbury, 7D	3½	4175	4½x5½	36x5	40x5d	W
Atterbury, 8E	5	5575	4¾x6	36x5	40x6d	W
Autocar, 21UF	1½-2	2300	4¾x4½*	34x4*	34x5*	D
Autocar, 21UG	1½-2	2400	4¾x4½*	34x4*	34x5*	D
Autocar, 26Y	....	4350	4¼x5½	34x5	36x10	D
Autocar, 26-B	....	4500	4¼x5½	34x5	36x10	D
Available, H1½	1½	2750	4 x5½	36x3½*	36x5*	W
Available, H2½	2½	3475	4 x5½	36x4*	36x8*	W
Available, H3½	3½	4475	4½x5½	36x5	40x5d	W
Available, H5	5	5375	4¾x6	36x6	40x12	W
Available, H7	7	6000	5 x6	36x6	40x14	B
Avery	1	....	3 x4	34x5†	34x5†	I
Beck, A. Jr.	1	1800	3¾x5	34x3½	34x4	I
Beck, C	2	2550	4½x5½	36x4	36x6	I
Bell, O	2½	2750	4½x5½	34x4	34x7	I
Bell, E	1½	2250	3¼x5¼	34x3½	34x5†	I
Belmont, E	2	2195	3¾x5	34x3½*	34x6*	D
Belmont, D	3½	3195	4 x6	36x5*	36x5d*	D
Bessemer, G	1	1700	3½x5	35x5†	35x5†	I
Bessemer, H-2	1½	2445	3¾x5	30x3½	36x5	I
Bessemer, J-2	2½	3285	4½x5¼	36x4	36x4	I
Bessemer, K-2	4	4485	4½x5½	36x6	36x10	I
Bethlehem, K	1	....	3½x5	34x4½†	35x5	I
Bethlehem, G	2	....	4 x5¼	34x3½*	34x6*	I
Bethlehem, H	3	....	4 x5¼	36x4*	36x8	I
Bethlehem, J	4	....	4½x5½	36x5*	36x5d*	I
Bolistrom, 30	1½	2100	3¾x5¼	34x3½	34x6	I
Bolistrom, 50	2½	2800	4¼x5½	36x4	36x8	I
Bolistrom, 70	3½	3800	4½x6	36x5	36x10	I
Bolistrom, A-20	4	6000	5¾x7	40x8†	40x8†	I
Bolistrom, B21	4	5050	4½x5½	36x7	36x7	I
Bridgeport, A	1½	2350	3¾x5¼	34x3	34x6	W
Bridgeport, B	2½	2850	4¼x5½	36x4*	36x7*	W
Bridgeport, C	4	3650	4½x6	36x5	36x5d	W
Bridgeport, D	6	4500	4½x6	36x6	36x6d	W
Brinton, F	2½	3400	4½x5¼	36x4	36x7	W
Brockway, E	¾	1675	3¾x5	35x5†	35x5†	B
Brockway, S-4	1½	2250	3¾x5	36x3½*	36x5*	W
Brockway, K-5	2½	3200	4½x5½	36x4	36x7	W
Brockway, R-4	3½	4100	4½x5½	36x5	36x5d	W
Brockway, T	5	5250	4¾x6	36x6	40x6d	W
Case, ††	2	3000	4¼x5¾	36x6	38x7	I
Capitol, G1½	1½	2975	3¾x5	35x5	38x7	W
Capitol, H2½	2½	3700	4¼x6	36x4	36x8	W
Capitol, K2½	2½	4250	4¼x6	36x6	42x9	W
Capitol, M3½	3½	4425	4¼x6	36x5	36x10	W
Champion Light Commercial	½	1100	3½x5	32x3½	32x3½	I
Chevrolet, G	¾	645	3½x4	31x4†	34x4½†	B
Chevrolet, T	1	1325	3½x5¼	33x4†	35x5†	W
Chicago, C1½	1½	....	3¾x5½	36x3½*	36x5*	W
Chicago, C2½	2½	....	4 x5½	36x4*	36x7*	W
Chicago, C3½	3½	....	4½x5½	36x5	36x10	W
Chicago, D5	5	....	4½x5½	36x6	40x12	W
Climber, A 20	1½	2450	3½x5	36x6*	38x7*	I
Clydesdale, 32C	1	2375	4¾x5	34x3½*	34x5*	W
Clydesdale, 42C	1½	2750	4¾x5	36x3½	36x5	W
Clydesdale, 65C	2½	3540	4¼x5½	36x4	36x7	W
Clydesdale, 65EC	2½	3775	4½x5½	36x4	36x7	W
Clydesdale, 90C	3½	4400	4½x5½	36x5	40x10	W
Clydesdale, 120C	5	5500	4¾x6	36x6	40x12	W
Collier, 18	1	....	3¾x5	34x4	34x5	W
Collier, 19	1½	....	3¾x5	36x4	36x6	W
Collier, 21	2	....	4¼x5¼	36x4	36x7	W
Collier, 22	2½	....	4½x5¼	36x4	36x4	W
Columbia, H	1½	2350	3¾x5	35x5†	34x5	I
Columbia, G	2½	2850	4 x5¼	36x4	36x7	I
Comet	1½	1950	3¾x5	34x4	34x4	W
Commerce, T	¾-1½	1450	3¾x5	34x4½†	34x4½†	B
Commerce, 12	1½	1800	3¾x5	35x5†	35x5†	I
Commerce, 16	2	2150	3¾x5	35x5†	35x6†	I
Concord, A	1½	2700	4 x5½	36x3½	36x6	W
Concord B	2½	3600	4¼x5½	36x4	36x8	W
Concord AX	1½	2950	4 x5½	36x3½	36x6	W
Concord, BX	2½	3600	4½x5½	36x4	36x8	W
Cook, 41	2	3000	4 x5½	36x6†	38x7†	I
Corbitt, E	1	2400	3¾x5	34x3½	34x4	W
Corbitt, D	1½	2800	3¾x5	36x3½	36x5	W
Corbitt, C	2	3500	4½x5¼	36x3½	36x7	W
Corbitt, B	2½	3650	4½x5¼	36x4	36x7	W
Corbitt, A	3½	4500	4½x5½	36x5	36x10	W
Corbitt, AA	5	5500	4¾x6	36x6	40x6d	W
Cyclone	1½	2800	3½x5	34x5†	36x6†	I
Dart, S	1½	....	3¾x5¼	34x3½	34x6	W
Dart, M	2½	....	4¼x5½	36x4	36x7	W
Dart, W	3½	....	4½x6	36x5	36x10	W
Day-Elder, A	1	2225	3¾x5	34x3½	34x4	W
Day-Elder, B	1½	2425	3¾x5	34x3½	34x5	W
Day-Elder, D	2	2900	4½x5¼	36x4*	36x7	W
Day-Elder, C	2½	3125	4¼x5	36x4	36x7*	W
Day-Elder, F	3½	3950	4½x5½	36x5*	36x5d*	W
Day-Elder, E	5	4875	4½x6	36x5	36x6d	W
Dearborn, F	1½	2180	3¾x5½	34x4*	34x5*	W
Dearborn, 48	2	2590	3¾x5½	35x5†	34x7†	W
Defiance G	1	1975	3¾x5	35x5†	35x5†	I
Defiance, D	1½	2550	3¾x5	35x5†	36x6†	I
Defiance, E	2	2750	3¾x5	35x5†	38x7†	I
DeKalb, E2	2½	2250	4¼x5½	34x3½*	36x5*	W
DeKalb, E2½	2	2600	4½x5¼	36x4*	36x6*	W
DeMartini 1½	1½	2600	3¾x5	34x3½	34x6	W
DeMartini 2	2	3300	4 x5½	36x3½	36x7	W
DeMartin i3	3	4250	4¼x5½	36x4	36x10	W
DeMartini 4	4	4800	4½x6	36x5	36x12	W
Denby, 33	1½	2300	3¾x5	35x5†	38x7†	I
Denby, 134	2	2800	3¾x5	36x3½	36x6	I
Denby, 25	3	3600	4½x5¼	36x4	36x7	I
Denby, 27	4	4600	4½x5½	36x5	36x5d	I
Denby, 210	5	5350	4½x5½	36x6	40x6d	I
Dependable, A	¾-1	1650	3½x5	34x5	36x6	W
Dependable, C	1½	2350	3¾x5¼	34x3½	34x5	W
Dependable, D	2	2650	4 x5½	34x5	36x6	W
Dependable, E	2½	2950	4¼x5½	36x4	36x7	W
Dependable, G	3½	3350	4½x6	36x6	38x7	W
Diamond T, O	1	2500	3¾x5¼	34x5†	36x6†	W
Diamond T, FS	1½	2960	3¾x5¼	36x3½	36x5	W
Diamond-T, T	1½	2650	3¾x5¼	36x3½	36x5	W
Diamond-T, U	2	3285	4 x5¼	36x4	36x7	W
Diamond-T, K	3½	4675	4¼x5½	36x5	36x5d	W
Diamond-T, EL	5	5400	4½x5½	36x6	40x6d	W
Diamond-T, S	5	5650	4¾x6	36x6	40x6d	W
Diehl, A	1	....	3½x5	34x4½	35x5	I
Diehl, B	1½	....	3¾x5	36x6	36x6	I
Dispatch, F	1	1350	3¾x5	34x4†	34x4†	I
Doane	2½	4100	4¾x5¾	36x5	36x7	C
Doane	3½	5100	4¾x5¾	36x5	36x5d	C
Doane	6	6000	4¾x6¾	36x6	40x6d	C
Dodge Brothers	½	1085	3⅞x4½	33x4†	33x4†	B
Dorris, K-4	2	3400	4¼x5½	36x4	36x7	W
Dorris, K-7	3½	4400	4½x5½	36x5	36x10	W
Double Drive B	3	4000	4¼x5½	6	6	W
Douglas G	1½	2050	3¾x5¼	36x5*	37x8*	W
Douglas I	3	3250	4¼x5½	36x6*	37x8*	W
Duplex, A	1½	2775	4 x5¼	35x5†	38x7†	W
Duplex, E	3½	4250	4¼x5½	36x8	36x8	I
Duty, 21	2	1490	3½x5	34x3½	34x5	I
Eagle, 100-2	2	2275	3¾x5¼	34x3½*	34x6*	I
Erie, A	2½	....	4½x5½	36x4	36x4d	W
Facto, 1921	2½	2895	4¼x5½	36x4*	36x8*	W
Fageol, (Cal.)	1½	3900	3¾x5¼	34x3½*	34x6*	W
Fageol, (Cal.)	2½	3900	4¼x5¾	34x4	36x7	W
Fageol (Ohio) Md	2½	3900	4¾x5¾	36x4*	36x4*	W
Fageol (Ohio) Hd	3½	5000	4½x6¼	36x5*	40x5d*	W
Fageol, (Cal.)	3½	5000	4½x6¼	36x5	36x5d	W
Fageol, (Cal.)	5	5700	4½x6¼	36x6	40x6d	W
Famous, B10	1	1800	3½x5	36x2¼	36x4	I
Famous, B12	1½	2100	3¾x5	36x3½	30x5	I
Fargo, R	2	2500	3¾x5	36x4	36x6	I
Federal, SD	1	2500	3¾x5	35x5†	36x6†	W
Federal, TE	1½	2725	4¼x5¼	36x3½	36x5	W
Federal, UE	2	3025	4¼x5¼	36x4	36x7	W
Federal, WE	3½	3950	4½x5½	36x5	36x5d	W
Federal, X2	5	5350	4¾x6	36x6	40x6d	W
Ford, TT	1	545	3¾x4	30x3½*	32x4½*	W
Forschler, A	1	....	3½x5	36x3	36x4	W
Forschler, AX	1½	....	3½x5	36x3½	36x5	W
Forschler, B	2	....	4¼x5¼	36x4	36x7	W
Forschler, BX	3	3450	4¼x5¼	36x4	36x8	W
F.W.D., B	3	4200	4¾x5½	36x6	36x6	B
Front Drive C	1½	2800	3¾x5½	5	4	W
Fulten, A	¾	1750	3½x5	35x5†	35x5†	B
Fulton, C	2	2350	3½x5	34x4	34x6	I
Garford, 15	¾	1500	3⅞x5½	34†5†	34x5†	W
Garford, 25	1¼	2090	3¾x5½	36x3½	36x4	W
Garford, 70-H	2	3190	4¼x5½	36x4	36x7	W
Garford, 68D	5	5200	5 x6½	36x6	40x6d	W
Garford, 77D	3½	4390	4½x6	36x5	36x6d	W
Garford, 150-A	7½	5500	5x6½	36x6	40x7d	C
Gary, F	1	2100	3¾x5	36x3½	36x4	W
Gary, I	1½	2550	4 x5½	36x3½	36x5	W
Gary, J	2½	3150	4¼x5½	36x4	36x7	W
Gary, K	3½	4050	4½x6	36x5	40x5d	W
Gary, M	5	5150	5 x6½	36x6	40x6d	W
G.M.C., 16	¾	....	3¾x5	35x5†	35x5†	B
G.M.C., 31	1½	....	3¾x5	36x3½	36x5	W
G.M.C., 41	2	....	4¼x5½	36x4	36x7	W
G.M.C., 71	3½	....	4½x5½	36x5	40x5d	W
G.M.C., 101	5	....	4½x5½	36x6	40x6d	W
Gersix M	1½	3100	4 x5½	36x3½	36x7	W
Gersix K	2½	3500	4½x5½	36x4	36x8	W
Gersix	3½	4500	4½x6	36x5	40x12	W
Giant, 15-A	1½	2425	3¾x5	34x3½	34x5	W
Giant, 16	2	3250	4¼x5¼	36x4	36x7	W
Giant, 17	3½	4150	4½x5½	36x5	36x5d	W
Globe D-20	¾	....	3¾x5	33x4½†	33x4½†	..
Golden West, G	3½	4500	4½x5½	36x6	36x6	W
Golden West, H	3½-4	5000	4½x6	36x6	36x6	W
Golden West, HA	7	6000	4½x6	36x6	36x10	W
Golden West, GH	3	4500	4½x6	36x6	36x6	W
Golden West, T	4	5500	4¾x6	36x6	36x6	W
Golden West, K	7	6000	5½x6	36x6	36x6	W
Gove, A1	2½	....	4¼x5¼	36x4*	36x7*	I
Graham Bros. A	1½	2495	3¾x5	35x5†	36x6†	I
Gramm-Bern., 10	1	1495§	3½x5	33x5†	33x5†	B
Gramm-Bern., 15	1½	2050§	3¾x5	36x3½*	36x5*	I
Gramm-Bern., 65	1½	2725§	3¾x5	36x3½*	36x5	W
Gramm-Bern., 20	2	3175§	4¼x5½	36x4*	36x7*	W
Gramm-Bern., 25	2½	3575§	4¼x5½	36x4*	36x4d*	W
Gramm-Bern., 35	3½	4375§	4½x5½	36x5	40x5d*	W
Gramm-Bern., 50	5	5275§	4¾x6	36x6	40x6d*	W
G.W.W.	1¾	2100	3¾x5½	35x5	35x5	I
Hahn, J4	1	....	3¾x5	34x5*	34x5*	W
Hahn, CD	1½	....	4½x5¼	36x3½*	36x6*	W
Hahn, EE	2½	....	4½x5½	36x4*	36x8*	W
Hahn, F	3½	....	4½x5½	36x5*	36x10	W
Hahn, EF	5	....	4¾x6	36x6	40x12	W
Hal Fur, E	1	2350	4 x5	35x5†	35x5†	W
Hal Fur, B	2½	3250	4¼x5½	35x5*	38x7*	W
Hal Fur, F	3½	4250	4½x5½	36x6†	40x10†	W
Hall	1½	3100	3¾x5	34x5†	38x7†	W
Hall	2½	3275	4½x5¼	36x4	36x6	W
Hall	3½	4100	4½x5½	36x5	36x5d	W
Hall	5	5100	4½x5½	36x5	40x6d	W
Hall	7	5100	4½x5½	36x5	40x6d	C
Harvey, WEA	1½	2550	4½x5½	34x3½	34x5	W
Harvey, WFA	2½	3300	4¼x5½	36x4	36x7	W
Harvey, WHA	3½	4300	4½x6	36x5	36x5d	W
Harvey, WKA	5	5280	4½x6	36x6	40x6d	W
Hawkeye, K	1½	2365	3¾x5¼	34x3½*	34x5*	I
Hawkeye, M	2	2915	4¼x5½	36x4*	36x6*	I
Hawkeye, N	3½	4345	4½x6	36x5*	36x10*	I
Hendrickson, K	5	4800	.....	.....	.....	..
Hendrickson, N	2½	3150	4¼x5¾	36x4*	36x7*	W
Hendrickson, M	3½	3975	4¼x5¾	36x5*	36x5d*	W
Highway, A410	4	....	4 x6	36x5	36x6d	W
Highway, B510	5	....	4 x6	36x5	40x6d	W
Higrade, A17	¾	1850	3½x5	32x4½	32x4½	W
Higrade, A18	1	2100	3½x5	35x5†	35x5†	W
Higrade, B20	1½	2500	4½x5¼	35x4†	36x6†	W
Huffman, B	1½	1995	3¾x5	34x3½	34x6	W
Huffman, C	1½	1795	3¾x5½	34x3½	34x6	I
Hurlburt	1½	....	4 x5½	34x4	34x5	W
Hurlburt	2½	....	4½x5½	36x4	36x4d	W
Hurlburt	3½	....	4½x6	36x5	36x5d	W
Hurlburt	5	....	4½x6	36x5	40x6d	W
Huron Erie	1½	2425	3¾x5¼	36x3½	36x5	I
Huron Mich.	2½	2950	4¼x5½	36x4	36x7	I
Indep'd't(Iowa),G	1½	2040	3¾x5¼	34x3½	34x5	I
Indep'd't(Ia.),H.I.	2½	2940	4½x5¼	34x4	34x6	I
Indep'd't(Iowa), B	1	1665	3½x5	34x3½	34x4	W
Indep't'd(Ohio), F	1½	2585	3¾x5	36x3½	36x5	W
Indep't'd(Ohio) H	2½	3285	4½x5¼	36x4	36x4d	W
Indep'd't(Ohio) K	3½	4285	4½x5½	36x5	36x5d	W
Indiana, 12	1¼	....	3¾x5¼	34x3½*	34x5*	W
Indiana, 20	2	....	4½x5½	36x4*	36x7*	W
Indiana, 25	2½	....	4½x5½	36x4*	36x8*	W
Indiana, 35	3½	....	4½x5½	36x5*	36x5d*	W
Indiana, 51	5	....	5 x6¼	36x5*	40x6d*	W
Inland, D	2	2950	4 x5	34x5	34x6	I
International, 21	1	1850	3½x5¼	36x3½	36x3½	I
International, S	¾	1500	3½x5	34x5†	34x5†	I
International, 31	1½	2050	3½x5¼	36x3½	36x4	I
International, 41	2	2490	3½x5¼	36x3½	36x5	I
International, 61	3	2800	4¼x5	36x4*	36x6*	I
International, 101	5	4500	4¼x5	36x5	40x10	I
Jackson, 4WD	3½	4550	4½x5½	36x7	36x7	B
Jumbo, 15	1½	2425	3¾x5¼	36x3½	36x5	I
Jumbo, 20	2	2675	3¾x5¼	35x5†	38x7†	I
Jumbo, 25	2½	3090	3¾x5¼	36x4	36x7	I
Jumbo, 30	3	3590	4¼x5½	36x6†	42x9†	I
Jumbo, 35	3½	4080	4½x6	36x5	36x10†	I
Jumbo, 40	4	4730	4 x6	38x7†	44x10	I
J & J, D	2	3250	4 x5	34x4*	34x6	I
Kalamazoo, G-1	1½	2800	3¾x5	34x4	34x5	W
Kalamazoo, G-2	1½-2	3100	3¾x5	36x4*	36x5*	W
Kalamazoo, H	2½	3700	4 x6	36x4	36x8	W
Kalamazoo, K	3½	4300	4½x6	36x5	36x10	W
Karavan, A	2½	....	4¼x6	36x4	36x8	W
Kearns, H	¾	1600	3¼x4½	32x4½†	32x4½†	I
Kearns, N	1½	2200	3½x5	34x3½	34x6	I
Kelly-Springfield K-31	1½	2900	3¾x5¼	36x3½	36x6	C
Kelly-S, K-35	2½	3250	3¾x5¼	36x4	36x4d	C
Kelly-S., K-34	1½	2900	3¾x5¼	36x3½	36x6	W
Kelly-S., K-36	2½	3250	3¾x5¼	36x4	36x4d	W
Kelly-S., K-40	3½	4200	4½x6½	36x5	40x5d	C
Kelly-S., K-50	5	4900	4½x6½	36x6	40x6d	C
Kelly-S., K-60	6	5100	4½x6½	36x6	40x7d	C
Kelly-S, K-41	3½	4200	4½x6½	36x5	40x5d	I
Kelly-S., K-42	3½	4200	4½x6½	36x5	40x5d	W
Kelly-S, K-45	4	4550	4½x6½	36x5	40x6d	C
Keystone, 40	2	2450	3¾x5½	34x5†	38x7†	I
Kimball, AB	2	3675	4 x6	36x4	36x8	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. All others solid. ††—Price includes body. §—Price includes several items of equipment.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Kimball, AC	2½	3975	4¼x6	36x4	36x8	W
Kimball, AK	3	4500	4½x6	36x4	36x10	W
Kimball, AE	4	5000	4⅝x6	36x5	40x10	W
Kimball, AF	5	5975	5 x6	36x6	40x12	W
Kissel, Express	1	1985††	37/8x5½	34x5†	34x5†	W
Kissel, Utility	1½	2775	37/8x5½	36x3½	36x5	W
Kissel, Freighter	2½	3475	4¼x5½	36x4	36x7	W
Kissel, H. D.	4	4475	4¼x5½	36x5	36x5d	W
Kleiber, AA	1	2600	4½x5¼	34x3½*	34x5*	W
Kleiber, A	1½	3100	4½x5¼	36x3½*	36x8*	W
Kleiber, BB	2	4000	4½x5½	36x4*	36x7*	W
Kleiber, B	2½	4200	4½x5½	36x5*	36x8	W
Kleiber, C	3½	4900	4½x5½	36x5	36x5d	W
Kleiber, D	5	5600	5 x6½	36x6	40x12	W
Koehler, D	1½	2285	3½x5	34x3½	34x5	W
Koehler, M	2½	3365	4 x5½	36x4	36x7	W
Koehler, MCS	2½	3450	4 x5½	36x4	36x7	W
Koehler, F	3½	....	4½x5½	36x5	36x10	W
Koehler, MT, Trac	5	3450	4 x5⅛	36x4	36x7	W
K-Z, 1	1	2250	3½x5	34x3½	34x5	W
K-Z, 1½	1½	2750	3⅝x5	36x4	36x6	W
K-Z, 2½	2½	3250	4¼x5¼	36x4	36x8	W
K-Z, 3½	3½	4250	4½x5½	36x5	40x10	W
K-Z, 5	5	5200	4½x5½	36x6	40x6d	W
Lange, B	2½	3350	4¼x5¼	36x4*	36x6*	C
Larrabee, U	1½	2400	3⅝x5	34x3½	34x5	W
Larrabee, K	2½	3400	4¼x5¼	36x4	36x7	W
Larrabee, L	3½	4200	4½x5½	36x5	36x5d	W
Larrabee, W	5	5100	4⅝x6	36x6	40x6d	W
L.M.C., 2-20	2½	2540	4¼x5¼	36x4	36x4d	I
Lion, L	1	2350	3⅝x5⅛	35x5†	35x5†	W
Lone Star, 9	1½	1545	3½x5	32x3½†	32x4†	I
Luedinghaus,	2-2½	3150	4¼x5¾	36x4*	36x7*	W
Luedinghaus, C	1	2100	3½x5	35x5†	35x5†	W
Luedinghaus, W	1½	2700	3⅝x5¼	34x3½*	34x5*	W
Maccar, L	1½	2925	4¼x5¼	36x4	36x6	W
Maccar, H	2½	3650	4½x5½	36x4	36x4d	W
Maccar, M-2	3½	4500	4½x6	36x5	36x5d	W
Maccar, G	5	5500	4⅝x6	36x5	40x6d	W
MacDonald, A	7½	5750	4½x6	40x7	40x14	I
Mack, AB D.R.	1½	3450	4 x5	36x4	36x3½d	D
Mack, AB Chain	1½	3000	4 x5	36x4	36x3½d	C
Mack, AB Chain	2	3300	4 x5	36x4	36x4d	C
Mack, AB D.R.	2	3750	4 x5	36x4	36x4d	D
Mack, AC Chain	3½	4950	5 x6	36x5	40x5d	C
Mack, AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack, AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack, AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac., AB	5	3400	4 x5	36x4	36x4d	C
Mack Trac., AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac., AC	10	5500	5 x6	36x6	40x6d	C
Mack Trac., AC	13	5750	5 x6	36x6	40x12	C
Mack Trac., AC	15	6000	5 x6	36x7	40x7d	C
Mapleleaf, AA**	2	4150	4 x5¼	34x4	36x6	W
Mapleleaf, BB**	3	4775	4½x5½	36x4	36x4d	W
Mapleleaf, CC**	4	5770	4½x5½	36x5	36x5d	W
Mapleleaf, DD**	5	6825	4½x5½	36x6	40x6d	W
Master, JW	1½	2690	4½x5½	34x3½	34x5	W
Master, W	2½	3290	4¼x5½	34x4	36x7	W
Master, D	2½	3540	4¼x5½	34x4	36x7	D
Master, A	3½	4190	4½x6	36x5	40x5d	W
Master, E	3½	4640	4½x6	35x5	40x5d	D
Master, B	5	5290	4⅝x6½	36x6	40x6d	W
Master, F	5	5440	4⅝x6½	35x5	40x6d	D
Master Trac., T	6	3740	4¼x5½	34x4	36x4d	I
Maxwell, 1½	1½	1332	3⅝x4¼	32x3	32x4	W
Menominee, HT	1	2080	3⅜x5	34x3½	36x5	W
Menominee, H	1½	2725	4 x5	36x3½	36x5	W
Menominee, D	2	3245	4 x6	36x4	36x4d	W
Menominee, G	3½	4270	4½x6	36x5	36x5d	W
Menominee, J3	5	5450	4⅝x6	36x6	40x6d	W
Moline, 10	1½	2450	3½x5	34x5†	36x6†	I
Moreland, 20N	1	2850	3⅜x5	35x5†	36x6†	I
Moreland, 21B	1½	3125	4¼x5¼	36x3½	36x6	W
Moreland, 21C	2½	3900	4½x5½	36x4	36x8	W
Moreland, 21H	3½	4975	4⅝x6	36x5	40x5d	W
Moreland, 21J	5	5350	4⅝x6	36c6	40x6d	W
Mutual, 2B	2	3450	4 x6	36x4	36x8	W
Mutual, 2BP	2½	4150	4 x6	38x7†	42x9†	W
Napoleon, 7	¾-1	1350	3½x5	38x4	33x4†	I
Napoleon, XX-7	1	1535	3½x5	35x5*	35x5*	I
Napoleon, 11	1½	1860	3½x5	35x5*	36x6*	I
Nash, 2018	1	1895	3⅜x5¼	34x3	34x4	I
Nash, 3018	2	2550	3⅜x5¼	34x4	34x6	I
Nash, Quad.	2	3250	4¼x5½	36x5	36x5	I
*Nelson, F1½	1½	....	4¼x5¼	36x3½	36x5	W
*Nelson, F2	2	....	4½x5¼	36x4	36x7	W
*Nelson, F3½	3½	....	4½x5½	36x5	36x5d	W
*Nelson, FCS	5	....	4⅝x6	36x6	40x6d	W
Netco, D	2	3100	4½x5¼	36x4*	36x7*	W
Netco, H	2½	3500	4½x5½	36x4*	36x8*	W
New York, M	1½	....	4½x5¼	36x3½	36x5	W
New York, N	2-2½	....	4½x5¼	36x4	36x4d	W
Niles, E	2	3000	4½x5¼	36x4*	36x7*	W
Noble, B30	1½	2585	3⅜x5¼	36x3½	36x5	W
Noble, C40	2	2825	4 x5½	36x4	36x7	W
Noble, D50	2½	3150	4¼x5½	36x4	36x8	W
Noble, E70	3½	4030	4½x6	36x5	36x10	W
Northway, B-2	2	3400	4 x6	36x4	36x4d	W
Northway, B-3	3½	4400	4 x6	36x5	40x5d	W
Northwestern W	2	3300	4¼x5½	34x4	36x6	W
Northwestern WS	2½	3300	4½x5½	36x4	36x8	W
Norwalk, 25E	1	1695	3½x5	34x3½	34x4	W
Norwalk, 35E	1½	2025	3½x5	34x3½	34x3½d	W
Norwalk, 35E, Spec	1½	2285	3⅜x5¼	34x3½	34x5	W
Ogden, A1	1½	2550	3⅜x5	36x3½	36x5	W
Ogden, E	2½	3250	4½x5½	36x4	36x7	W
O. K., K1	1½	2675	4 x5½	36x3½†	36x7†	W
O. K., L1	2½	3450	4¼x5½	36x4	36x8	W
O. K., M1	3½	4250	4½x6	36x5	36x5d	W
Old Hickory, W	1	2175	3⅜x5	36x3½*	36x4*	W
Old Reliable, A	1	2350	4 x5	34x4	36x6	W
Old Reliable, B	1½	3500	4¼x6	34x4	36x4d	W
Old Reliable, C	2½	4250	4¼x6	36x5	36x5d	W
Old Reliable, D	3½	5250	4⅝x6	36x6	40x6d	W
Old Reliable, KLM	5	6250	4⅝x6¼	36x6	40x7d	C
Oldsmobile Econ.	1	1500	3⅛x5¼	35x5†	35x5†	I
Olympic, A	2½	3500	4¼x5½	36x4	36x7	W
Oneida, A-9	1¼	2350	3⅜x5½	36x3½	36x5	W
Oneida, B-9	1¾	2915	4 x5¼	36x4	36x7	W
Oneida, C-9	2½	3390	4 x5¼	36x4	36x7	W
Oneida, D-9	3½	4345	4½x5½	36x5	36x10	W
One'da, E-9	5	5460	4½x5½	36x6	40x12	W
Orleans, A	1½	2750	3⅜x5⅛	36x3½	36x5	W
Orleans, B	2½	3250	4x5⅛	36x4*	36x7*	W
Orleans, C	3½	3750	4½x5½	36x4½	36x8	W
Orleans, D	5	4250	4½x5½	30x6	40x8	W
Oshkosh, A	2	3750	3½x5	36x6†	36x6†	4
Oshkosh, AA	2	3850	3½x5	36x6†	36x6†	4
Oshkosh, B	2½	4150	4 x5¼	38x7†	38x7†	4
Oshkosh, BB	2½	4300	4 x5⅛	38x7†	38x7†	4
Packard, EC	....	3700	4¼x5½	36x3½	36x6	W
Packard, ED	....	4450	4½x5½	36x5	36x5d	W
Packard, EF	....	5550	5 x5½	36x6†	40x6d†	W
Packard, EX	....	4200	4¼x5½	36x6†	38x7†	W
Paige, 52-19	1½	2880	4 x5¼	34x3½	34x6	W
Paige, 54-20	2½	3400	4¼x5½	34x4	34x4d	W
Paige, 51-18	3½	4285	4½x5½	36x5	36x5d	W
Parker, F20	2	3500	4 x6	34x4	36x4d	W
Parker, J20	3½	4400	4½x6	36x5	40x5d	W
Parker, M20	5	5500	4⅝x6	36x6	40x6d	W
Patriot, Revere	¾	1785	3⅜x5	35x5†	35x5†	W
Patriot, Lincoln	1½	2450	4 x5¼	34x3½*	34x5*	W
Patriot, Washgt'n	2½	3450	4½x5½	36x4*	36x7*	W
Piedmont, 4-30	1½	1685	3½x5	34x4†	34x4†	W
Pierce-Arrow,	2	3750	4 x5½	36x4	36x4d	W
Pierce-Arrow	3½	4950	4½x6⅝	36x5	36x5d	W
Pierce-Arrow	5	5700	4½x6⅝	36x5	40x6d	W
Pioneer, 59	1	1650	3⅜x4¼	32x4½†	32x4½†	W
Pittsburger, B 21	2½-3	3800	4½x5¼	36x5*	36x7*	W
Pony	¼	400	28x3†	28x3†	C	
Power, F	1½	....	3⅜x5¼	36x6	36x6	..
Power, C	3½	....	4¼x5½	36x5	40x10	W
Premocar, B-143	1½	2475	3½x5	36x6†	36x6†	W
Ramier, R-11	¾	2150	3½x5	35x5†	35x5†	W
Rainier, R-15	3½	4500	4½x5½	36x5	36x5d	W
Rainier, R-19	1	2350	3½x5	34x3½	31x4	W
Rainier, R-16	1½	2600	3⅜x5	34x3½	34x5	W
Rainier, R-18	2	2950	4¼x5¼	34x4	34x6	W
Rainier, R20	2½	3600	4½x5¼	34x4	34x7	W
Rainier, R17	5	5250	4½x6	36x6	36x6d	W
Ranger, TK-20-2	2	....	3⅜x5	36x6†	36x6†	W
Ree, F	¾-1½	1385	4½x4½	34x4½†	34x4½†	B
Reliance, 10A	1½	2500	4 x5½	36x3½	36x5	I
Reliance, 20B	2½	3200	4¼x5½	36x4	36x4d	I
Republic, 10	1	1695	3⅜x5	35x5†	35x5†	I
Republic, 10Exp.††	1	2095	.....	35x5†	35x5†	I
Republic, 11X	1½	2295	3⅜x5	34x3½	34x5	I
Republic, 19	2½	2795	4¼x5¼	36x4	36x7	I
Republic, 20	3½	3845	4½x5½	36x5	36x10	I
Riker, B	3	....	4¼x6	36x5	36x5d	W
Riker, BB	4	....	4¼x6	36x5	36x6d	W
Rowe, CW	1½	3000	3⅜x5	36x6†	36x6†	W
Rowe, HW	4	4500	4¼x6	36x5	36c6d	W
Rowe, C. D. W.	2	3300	4 x5	34x4	36x3½d	W
Rowe, G. S. W.	3	4150	4 x6	34x5	36x5d	W
Rowe, G. P. W.	3	5250	3½x5†	38x7†	42x9†	W
Rowe, F. W.	5	5500	4½x6	36x6	40x6d	W
Rumely, A	1½	2720	3⅜x5¼	36x3½	36x5	W
Samson, KO 15	¾	865	.....	32x4	32x4	B
Samson, E 25	1¼	1395	.....	35x5	35x5	B
Sandow, G	1	2295	3⅜x5	34x3½	34x5	W
Sandow, CG	1½	2590	3⅜x5	34x4	34x6	W
Sandow, J	2½	3275	4½x5¼	36x4	36x7	W
Sandow, M	3½	4295	4½x5½	36x5	36x5d	W
Sandow, L	5	4975	4½x5½	36x6	40x6d	W
Sanford, 25	2½	3350	4¼x5¼	36x4	36x4d	W
Sanford, 35	3½	4200	4½x5½	36x5	36x5d	W
Sanford, 50	5	5100	4⅝x6	36x5	40x6d	W
Schacht, 2-Ton	2	3550	4¼x5½	36x4	36x7	W
Schacht, 2½-Ton	2½	3850	4¼x5½	36x4	36x4d	W
Schacht, 3½-Ton	3½	4350	4¼x6	36x5	36x5d	W
Schacht, 5-Ton	5	5350	4½x6	36x5	40x6d	W
Schwartz, A	1	1685	3½x5	33x4½†	33x4½†	B
Schwartz, BW	1½	2600	3⅜x5¼	34x3½*	34x7*	W
Schwartz, C.W.S.	2½	3200	4¼x5½	36x4	36x8	W
Schwartz, DW	5	4900	4½x6	36x6	40x12	W
Selden, 1½A	1½	2360	3⅜x5	34x3½	34x5	W
Selden, 2½A	2½	3425	4½x5¼	36x4	36x7	W
Selden, 3½A	3½	4175	4½x5½	36x5	36x10	W
Selden, 5A	5	5600	4⅝x6	36x6	40x12	W
Seneca, M20	½	....	3½x4½	30x3½†	30x3½†	B
Service, 220	1	2415	3½x5½	34x3½	34x5	W
Service, 15	¾-1	1840	4⅝x5	34x4½	34x5	B
Service, 31	1½	2985	4 x5½	36x3½	36x6	W
Service, 36	1½	3415	4¼x5½	35x5†	38x7†	W
Service, 51	2½	3475	4¼x5½	36x4	36x7	W
Service, 71	3½	4285	4¼x5½	36x5	36x5d	W
Service, 76	3½	4485	4½x6	36x5	36x5d	W
Service, 10	5	5275	4½x6	36x6	40x6d	W
Signal, NF	1	2475	4⅜x5	34x5†	36x6†	W
Signal, H	1½	2925	4⅛x5¼	34x4	36x6	W
Signal, J	2½	3275	4⅛x5¼	34x4	36x8	W
Signal, M	3½	4275	4½x5½	36x5	40x5d	W
Signal, R	5	5300	4⅜x6	36x6	40x6d	W
Southern, 10	1	2090	3⅜x5	34x3½	34x4	W
Southern, 15	1½	2590	3⅜x5¼	36x6†	34x4	W
Southern, 20	2	2990	4⅜x5¼	36x6†	40x8*	W
Standard, 1-K	1½	1950	3⅜x5	34x3½*	34x5*	W
Standard, 1K	1½	2150	3⅜x5	36x6†	36x6†	W
Standard, 76	2½-3	3100	4¼x5¼	36x4*	36x7*	W
Standard, 66	3½-4	4000	4½x5½	36x5	36x10	W
Standard, 5-K	5-6	5250	4⅝x6	36x6	40x12	W
Sterling, 1½	1½	3200	4 x5⅜	36x3½	36x5*	W
Sterling, 2	2	3500	4 x5⅜	36x4	36x6	W
Sterling, 2½	2½	3650	4⅜x5⅜	36x4*	36x4d*	W
Sterling, 3½	3½	4650	4½x6¼	36x5*	40x5d*	W
Sterling, 5-W	5	5500	5 x6¼	36x6*	40x6d*	W
Sterling, 5-C	5	6000	5 x6¼	36x6	40x6d	C
Sterling, 7½	7½	6500	5 x6¼	36x6	40x7d	C
Stewart, 11	¾	1350	3½x4½	32x4†	32x4†	I
Stewart, 12	1	1750	3½x5	35x5†	35x5†	I
Stewart, 9	1½	2200	3⅜x5	34x3½	34x5	I
Stewart, 7	2	2800	4¼x5¼	34x4	34x7	I
Stewart, 7-X	2½	2950	4¼x5½	34x4	34x7	I
Stewart, 10	3½	3850	4½x5½	36x5	36x5d	I
Stewart, 10-X	3½	3850	4½x6	36x5	36x5d	I
Stoughton, A	1	1995	3⅜x5¼	34x4½†	35x5†	W
Stoughton, B	1½	2350	3⅜x5¼	36x3½	36x5	W
Stoughton, D	2	2800	4 x5¼	36x4	36x7	W
Steughton F	3	3600	4¼x5½	36x5	36x5	W
Sullivan, E	2	3350	4¼x5½	36x4*	36x7*	W
Sullivan, H	3½	4650	4½x6	36x5	36x5d	W
Superior, D	1	1800	3⅜x5	34x4½†	34x4	I
Superior, E	2	2750	4¼x5¼	36x4	36x6	I
Super Truck, 50	2½	3300	4 x6	36x4	36x8	W
Super Truck, 70	3½	4300	4¼x6	36x5	40x5d	W
Super Truck, 100	5	5300	4⅜x6	36x5	40x12	W
Super Truck 150	7½	6300	5 x6	36x6	40x7d	W
Texan, A38	¾	1095	3½x5	33x4	33x4	I
Texan, TK39	1½	1550	3½x5	36x6	38x7	W
Tiffin, GW	1½	2695	4½x5¼	36x3½	36x5	W
Tiffin, MW	2½	3580	4½x5¼	36x4	36x3½d	W
Tiffin, PW	3½	4760	4½x5½	36x5	40x5d	W
Tiffin, F50	5	5850	4⅜x6	36x6	40x6d	W
Tiffin, F60	6	6050	4⅜x6	36x6	40x12	W
Titan, HT	3½	4550	4½x6	34x4*	40x5d	I
Titan, HD	6	5400	4½x6	36x5	40x6d	I
Titan, TS	2½	3400	4¼x5½	34x4*	36x4d	I
Tower, J	1½	3000	4½x5½	35x5	38x7	W
Tower, H	2½	3475	4½x5¼	36x4	36x7	W
Tower, G	3½	4400	4½x5½	36x5	36x5d	W
Traffic, C	2	1595	3⅜x5	34x3½*	34x5*	I
Transport, 20	1	1850	3⅜x5¼	34x3½	34x4	I
Transport, 30	1½	2250	3⅜x5	36x3½	36x5	I
Transport, 50	2½	2785	4¼x5½	36x4	36x7	I
Transport, 70	3½	4195	4½x6	36x5	36x10	I
Traylor, B	1½	2500	3⅜x5⅛	34x3½	34x5	W
Traylor, C	2	3000	4 x5½	36x4	36x7	W
Traylor, D	3	3500	4¼x5½	36x4	36x8*	W
Traylor, E	4	4700	4½x6	35x5	40x10	W
Traylor, F	5	5100	4½x6	36x6	40x6d	W
Triangle, AA	¾-1	1600	3¼x5	35x5†	35x5†	I
Triangle, A	1½	2350	3⅜x5¼	34x3½*	34x6*	I
Triangle, C	2	2700	3⅜x5¼	36x4*	36x6*	I
Triangle, B	2½	2950	4 x5⅜	36x4*	36x7*	I
Triumph, HB	2	2900	3⅜x5¼	36x4	36x7	W
Triumph, HC	1½	2550	3⅜x5¼	36x3½	36x5	W
Triumph, G	1	1995	3⅜x5⅛	34x5†	34x5†	W
Twin City, B.W.	2	3000	4 x5½	36x4	36x7	I
Twin City, A. W.	3½	4400	4¼x6	36x5	40x5d	W
Twin City, FWDB	3½	4750	5½x6	36x6	36x6	I
Twin City, FWDA	5	5250	5½x6	36x7	36x7	I
Ultimate, A	2	3200	4 x5½	36x3½*	36x6*	W
Ultimate, AJ	2	3250	4¼x5½	35x5†	38x7†	W
Ultimate, B	3	3750	4¼x5½	36x4*	36x4d*	W
Ultimate, BL	3	3850	4¼x5½	36x4*	36x4d*	W
Union, F W	2½	3490	4 x6	36x5*	36x8*	D
Union, H W	4	4485	4½x6	36x6	40x12	D
Union, J W	6	5800	5 x6	36x6	40x14	D
United, A	1½	2445	3⅜x5¼	36x3½*	34x5*	I
United, B	2½	3150	4¼x5½	36x4*	36x7*	I
United, C	3½	3975	4¼x5½	36x5	36x5d	I
United, V	5	5100	4½x6	36x6	40x6d	I
U. S., N	1½	2475	3⅜x5	36x3½*	36x5*	I
U. S., R	3	3795	4 x5¼	36x4	36x4d	W
U. S., S	4	4595	4½x5½	36x5	36x5d	W
U. S., T	6	5850	4⅝x6½	36x6	40x6d	W
Velie, 46	1½	2200	3⅜x5	36x3½	36x5	I
Veteran, E**	1-1½	3500	3⅜x5¼	35x5†	36x6†	W
Veteran, A**	2-2½	4000	4¼x5½	36x4*	36x7*	W
Veteran, D**	2½-3	4400	4¼x5½	36x4*	36x7*	W
Veteran, H**	3½-4	5600	4½x6	36x5	36x5d	W
Victor, A	1½	2050	3⅜x5	34x4	34x5	I
Vim, 29	½	1355	3½x4½	31x4†	31x4†	W
Vim, 31	1	2475	3⅜x5⅛	35x5†	35x5†	W
Vim, 22	2	3150	3⅜x5⅛	36x4	36x6	W
Vim, 23	3	3950	4¼x5½	36x5	36x5d	W
Vulcan, 25	2½	4000	4¼x6	36x4	36x8	W
Vulcan, 25P	3	4800	4¼x6	36x6	40x8	W
Walker-Johnson, B	2½	3500	4¼x5½	36x4	36x8	W
Walter, S	5	5600	4½x6¼	36x5	40x6d	I
Waltham, E	1½	2350	3⅜x5¼	36x6†	38x7†	W
Ward-LaF., 2B	2½	3590	4⅜x5⅜	36x4	36x7	W
Ward-LaF., 4A	3½	4690	4½x6¼	36x5	36x5d	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. All others solid. ††—Price includes body. §—Price includes several items of equipment.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Ward-LaF., 5A	5	5590	5 x6¼	36x6	36x6d	W
Watson, E	1	1865	3¾x5¼	34x4½†	34x4½†	W
Watson, N	3½	4250	4½x5½	36x5	36x10	W
Western, W1½	1½	2550	4½x5¼	36x3½*	36x5*	W
Western, L1½	1½	2550	3¾x5	36x3½*	36x5*	W
Western, W2½	2½	3250	4½x5¼	36x4	36x7	W
Western, L2½	2½	3250	4¼x6	36x4	36x7	W
Western, W3½	3½	4250	4½x6	36x5	40x5d	W
White, 15	¾	2600	3¾x5½	34x5†	34x5†	B
White, 20	2	3450	3¾x5½	36x4*	36x7	D
White, 40	3½	4500	3¾x5¾	36x5	40x5d	D
White, 45	5	5000	4¼x5¾	36x6	40x6d	D
White, Hick., E	1	2450	3¾x5	34x5†	34x5†	W
White, Hick., H	1½	2750	3¾x5	36x3½	36x5	W
White Hick., K	2½	3350	4½x5¼	36x4	36x5	W
Wichita, K	1	2300	3½x5	36x3*	36x4*	W
Wichita, L	1½	2600	3¾x5¼	36x3½*	36x5*	W
Wichita, M	2	2800	3¾x5¼	36x3½*	36x6*	W
Wichita, R	2½	3000	3¾x5¼	36x4*	36x7*	W
Wichita, RX	2½	3600	4¼x6	36x4*	36x8*	W
Wichita, O	3½	4000	4¼x6	36x5*	36x5d*	W
Wichita, S	5	5000	4½x6	36x6	40x6d	W
Wilcox, AA	1	2100	3¾x5½	36x4*	36x4*	W
Wilcox, B	1½	2775	4¼x5	36x4	36x5	W
Wilcox, D	2½	3300	4¼x5	36x4*	36x3½d*	W
Wilcox, E	3½	4250	4½x6	36x5*	36x5d*	W
Wilcox, F	5	5200	4¾x6½	36x5	40x6d	W
Wilson, F	1½	2650	3¾x5	36x3½	36x5	W
Wilson, EA	2½	3300	4½x5¼	36x4	36x7	W
Wilson, G	3½	4300	4½x5½	36x5	36x5d	W
Wilson, H	5	5275	4¾x6	36x6	40x6d	W
Winther, 751	¾	1795	3½x5	34x4½†	35x5†	I
Winther, 430	1½	2850	3¾x5	32x4	32x4	I
Winther, 39	1½	2450	3¾x5	34x3½	34x5	I
Winther, 49	2	3250	4 x5	34x4	34x4d	I
Winther, 450	2½	3690	4 x5	34x5	36x6	I
Winther, 70	3½	4200	4 x6	36x5	36x5d	I
Winther, 109	5	5250	4½x6	36x6	40x5d	I
Winther, 140	7	5900	5 x6	36x6	40x7d	I
Witt-Will, N	1½	2750	3¾x5	36x3½*	36x5*	W
Witt-Will, P	2½	3250	4½x5¼	36x3½*	36x7*	W
Wolverine, J	1	2240	3½x5	34x3	34x4	I
Wolverine, J	1½	2495	3¾x5	34x3½	34x5	I
Wolverine, J	2	2750	3¾x5	34x4	34x7	I
Wolverine, J	2½	3475	4¼x5¼	36x5	36x10	I
Wolverine, L	3½	4150	4½x5½	36x5	36x10	I
Yellow Cab M2	¾	2350	3¾x5	32x4	32x4	B
Yellow Cab M4	1¼	2350	3¾x5	34x4½	34x4½	W

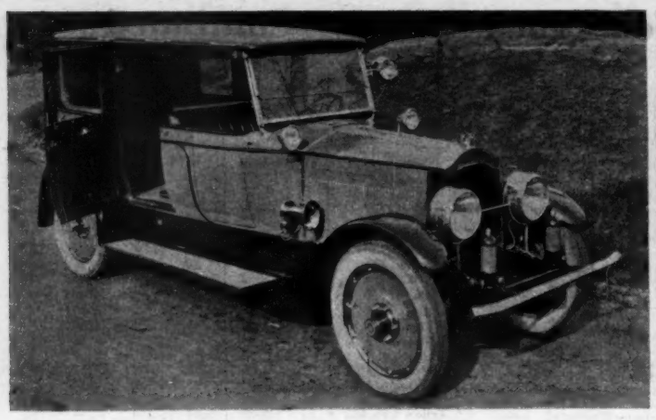
*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

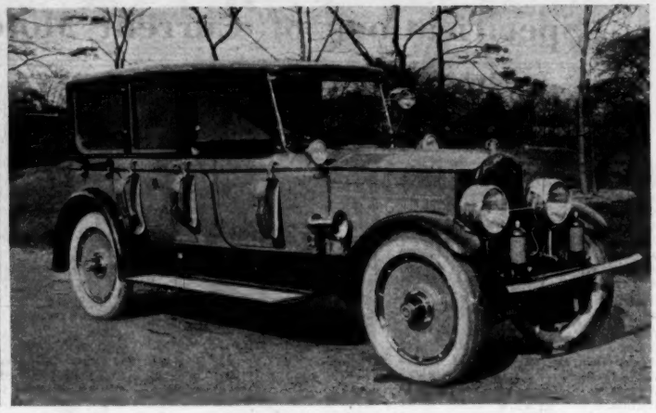
Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. All others solid. ††—Price includes body. §—Price includes several items of equipment.

Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
All-In One	12-25	$1975	3	Weid.	4-3¾x5½	GDK	2-3
Allis-Chalm. B	6-12	925	2	LeR.	4-3½x4½	Gas.	1
Allis-Chal. G.P	6-12	850	2	LeR.	4-3½x4½	Gas.	1-2
Allis-Chalm.	12-20	1495	2	Mid.W	4-4¼x5¼	Gas.	2-3
Allis-Chalm.	18-30	2150	4	Own	4-4¾x6½	GorK	3-4
Allis-Chalm.	10-18	875	4	Own	4-4¾x6½	G,K	4
Allwork 2-G	14-28	....	4	Own	4-4¾x6	GorK	3
Allwork C	14-28	....	4	Own	4-5 x6	GorK	3
AndrewsKin.D	18-36	2500	4	Clim.	4-5 x6½	GorK	4
Ano A	3-5	....	4	Own	1-4½x5	Gas.	..
Appleton	12-20	1500	4	Buda	4-4¼x5½	G,K	2-3
Aro 1921	3-5	650	4	Own	1-4½x5	Gas.	1
Aultman-T.	15-30	....	4	Clim.	4-5 x6½	G,K	4
Aultman-T.	22-45	....	4	Own	4-5½x8	G,K	6
Aultman-T.	30-60	....	4	Own	4-7 x9	G,K,D	8
Automot. B-3	12-24	1785	4	Herc'ls	4-4 x5½	Gas.	2-3
Avery,SR.Cul	5-10	....	4	Own	4-3 x4	G,K	..
Avery Cult-C	....	....	3	Own	6-3 x4	G,K	..
Avery B	5-10	....	4	Own	4-3 x4	G,K	2
Avery C	....	....	4	Own	6-3 x4	G,K	..
Avery	8-16	....	4	Own	2-5½x6	G,K,D	2-3
Avery	12-20	....	4	Own	4-4¾x6	G,K,D	2-3
Avery	12-25	....	4	Own	2-6½x7	G,K,D	3-4
Avery	14-28	....	4	Own	4-4½x7	G,K,D	3-4
Avery	18-36	....	4	Own	4-5½x6	G,K,D	4-5
Avery	25-50	....	4	Own	4-6½x7	G,H,D	5-6
Avery	45-65	....	4	Own	4-7¾x8	G,K,D	8-10
Bates	15-25	....	4	Own	4-4¼x6	Ker.	3
Bates S.M.	15-22	....	*4	Own	4-4¼x6	G,K,D	3
Bates Mule F	18-25	....	*2	Midw	4-4¼x5¼	Gas.	3
Bates Mule H	15-25	....	4	Midw	4-4¼x5¼	Gas.	3
Bates Mule G	25-35	....	*2	Midw	4-4¼x6	Gas.	com.
Bean	8-16	....	*1	Own	14-3½x4	G,K	2-3
Beeman G	2-4	340	4	Own	1-3½x4½	Gas.	½
Best	30	....	*2	Own	4-4¾x6½	G,K,D	4
Best	60	....	*2	Own	4-6½x8½	G,K,D	8-9
Boring 1921	....	1850	3	Wauk	4-4¾x5¾	GorK	2
Burn-Oil 1921	15-30	1650	4	Own	2-6¾x7	Ker.	3-4
Capital	15-30	1000	2	Own	4-4¾x6	Gas.	33
Case	10-18	1090	4	Own	4-3½x5	GorK.	2
Case	15-27	1680	4	Own	4-4½x6	GorK	3
Case	22-40	3100	4	Own	4-5½x6¾	GorK	4-5
Caterpillar T11	25	....	*2	Own	4-4¾x6	Gas.	4
Caterpillar T16	40	....	*2	Own	4-6½x7	Gas.	6
Centaur	5-2½	495	2	N Way	2-4½x4½	G or K	1-9
Chase	12-25	....	3	Buda	4-4¼x5½	GorK	2-3
Chicago 40	40	2500	4	Own	4-4½x6	Gas.	4
Cletrac W	12-20	1495	*2	Own	4-4 x5½	G,K,D	2-3
Dakota 4	15-27	1750	3	Dom.	4-4¾x6	Gas.	3
Dart B.J.	15-30	....	4	....	4-4½x6	Gas.	3-4
Depue A	20-30	2500	4	Buda	4-4½x6	Gas.	4
Dill D	20	2480	4	Cont.	4-4½x5½	Gas.	3
Dill R.W.	20-	2980	4	Midw.	4-4½x6	Gas	3
De-It-All	4-6	595	..	Own	1-4½x5	Gas.	⅔
Eagle F	12-22	1390	4	Own	2-7 x8	GorK	3-4
Eagle F	16-30	1850	4	Own	2-8 x8	GorK	4-5
E-B. AA	12-20	....	4	Own	4-4¾x5	GorK	4
E-B. Q	12-20	....	4	Own	4-4¾x5	GorK	3
E-B.	16-32	....	4	Own	4-5¼x7	GorK	4
Evans	18-30	2000	4	Buda	4-4½x6	G,K	3
Fageol D	9-12	1525	4	Lyc.	4-3½x5	Gas.	2
Farm Horse	18-30	1885	4	Clim.	4-5 x6½	G,K	3-4
Farquhar	15-25	....	4	Buda	4-4½x6	G,K,D	3-4
Farquhar	18-35	....	4	Own	4-6 x8	G,K,D	4-5
Farquhar	25-50	....	4	Own	4-7 x8	G,K,D	6-7
Fitch 4	20-35	....	4	Clim.	4-5 x6½	GorK	3-4
Flour City	20-35	....	4	Own	4-5¼x6	Ker.	4-6
Flour City	30-50	....	4	Own	4-6¾x7	Ker.	6-8
Flour City	40-70	....	4	Own	4-7½x9	Ker.	8-1
Fordson	20	625	4	Own	4-4x5	G,K	2
Fox E	20-40	1300	4	Own	4-5½x7½	G or K	4
Franklin G	18-30	4000	*2	Clim.	4-5 x6½	G or K	3-3
Franklin C	18-30	3350	*2	Clim.	4-5x6½	G or K	3-4
Franklin G 2	18-30	4350	2	Clim.	4-5 x6½	G or K	3-4
Frick A	12-20	....	4	Erd.	4-4 x6	G,K	2-3
Frick C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
Fulton	10-20	1275	3	Wauk	4-4¼x5	Gas.	2
G-O G	14-28	$1485	4	Wauk.	4-4½x5¾	GorK	3
Grain Belt A	18-36	2150	4	Wauk	4-4¾x6¾	GorK	4
Gray 1920	18-36	....	3	Wauk	4-4¾x6¾	Gas.	4
Ground Hog	19-31	2000	4	Erd.	4-4 x6	GorK	3
Gt. Western St	20-30	1950	4	Beav.	4-4¾x6	K.	4
Hart-Parr 20	-20	1195	4	Own	2-5¼x6½	K.D	3
Hart-Parr 30	15-30	1595	4	Own	2-6½x7	K,D	3
Heider D	9-16	....	4	Wauk	4-4¼x5¾	G,K	2
Heider C	12-20	....	4	Wauk	4-4½x6¾	G,K	3
Heider Cult	6-10	....	4	LeR.	4-3½x4½	Gas.	1
Hicks	20-30	....	4	....	4-4½x6	KorG	4
Huber Light 4	12-25	1385	4	Wauk	4-4½x5¾	GorK	3
Huber Super 4	15-30	1885	4	Midw.	4-4½x6	Gas.	3
Illinois, Super-Drive C	18-36	2500	4	Clim.	4-5 x6½	G,K	4
Imperial E	40-70	5000	4	Own	4-7½x9	G,K,D	10
Indiana F	5-10	....	2	LeR.	4-3½x4½	Gas.	1-2
International	8-16	1000	4	Own	4-4¼x5	G,K,D	2
International	15-30	1950	4	Own	4-5¼x8	G,K,D	4
J-T N	20-40	3485	*2	....	4-4¾x6	G,K,D	3-4
Klumb F	16-32	....	4	Clim.	4-5 x6½	....	..
LaCrosse M	6-12	900	4	Own	2-4 x6	G,K	1
LaCrosse G	12-24	1250	4	Own	2-6 x7	GorK	3
Lausen	12-25	1495	4	Midw.	4-4½x5¼	Gas.	3
Lausen	15-25	1685	4	Beav.	4-4½x6	GorK	3-4
Lauson 21	15-30	1985	4	Beav.	4-4¾x6	GorK	3-4
Leader B	12-18	1095	4	Own	2-6 x6½	G,K,D	2-3
Leader N	16-32	1985	4	Clim.	4-5 x6½	G,K	3-4
Leader GU	18-35	2775	*	Clim.	4-5x6½	G,K	3-4
Leonard E	20-30	2530	4	Buda	4-4½x6	G,K	3
Liberty A	18-32	2475	4	Clim.	4-5 x6½	G,K	4
Linn W	60	5600	*	Wauk.	4-5 x6¼	Gas.	6
Little Bear	4	850	4	Ford	4-3¾x4	Gas.	..
Little Giant B	16-22	2200	4	Own	4-4½x5	K.	4
Little Giant A	26-35	3300	4	Own	4-5½x6	K.	6
Lombard	85-150	....	*2	....	6-5½x6¾	Gas.	16
Lombard	50	....	*2	....	4-4¾x6½	....	6-10
Motor Macult	1½	225	2	Own	1-2¾x3½	Gas.	..
Magnet B	14-28	1875	4	Wauk	4-4½x6¼	K&G	3
Master Jr	5-10	585	..	LeR.	-2¾x4	Gas.	1
MerryGar1921	2	230	2	Evin	1-2¾x2½	Gas.	..
Minne All-P	12-25	1325	4	Own	4-4½x7	GorK	3
Minne. Gen.P.	17-30	....	4	Own	4-4¾x7	GorK	3-4
Minne. Med.Duty	22-44	....	4	Own	4-6x7	GorK	5-6
Minne. HeavyDuty	35-70	....	4	Own	4-7½x9	GorK	8-9
Mohawk 1921	8-16	785	4	Light	4-3½x4½	KorG	1-2
Moline Univ D	9-18	1075	2	Own	4-3½x5	Gas.	2-
Moline Orch	9-18	1075	2	Own	4-3½x5	Gas.	2-3
Monarch B	30-20	3400	*2	Beav.	4-4¾x6	G or K	4
Motor	15-30	2250	4	Buda	4-4½x6	Gas.	3-4
NB 1	3-6	425	4	Own	2-3½x4	Gas.	¾
NB 2	3-6	425	4	Own	2-2¾x4	Gas.	¾
Nichols-Shep. 20-42	20-42	3100	..	Own	8 x10	GorK	3-6
Nichols Shep. 25-50	25-50	3460	..	Own	9 x12	GorK	4-7
Nilson Jr. E	15-25	1775	4	Wauk	4-4¼x5¾	G or K	3
Nilson Senior	20-40	2675	5	Wauk	4-5 x6¼	G,K	4
Oil Pull K	12-20	1485	4	Own	2-6 x8	K,D	3
Oil Pull H	16-30	2285	4	Own	2-7 x8½	K,D	4
Oil Pull G	20-40	3175	4	Own	2-8 x10	K,D	5-6
Oil Pull E	30-60	4590	4	Own	2-10x12	K,D	8-10
Oldsmar GarK	2½-5	395	4	Own	1-5½x5½	Gas.	2½
Oliver A	15-30	....	*2	Beav.	4-4½x6	GorK	3-4
Once Over Tiller Mark 6	12-25	3000	4	Strns	4-4½x6	Gas.	2
Parrett K	15-30	1950	4	Pitt	4-4½x6	G,K	3
Peoria L	12-25	1785	4	Clim.	4-5 x6½	G,K	3
Pioneer G	18-36	....	4	Own	4-5½x6	G,K,D	4
Pioneer C	30-60	....	4	Own	4-7 x8	Gas.	10
Planet Jr.	5-10	960	2	LeRoi	4	Gas	1
Plowman A	15-30	1995	4	Buda	4-4½x6	G,K	3-4
Port Huron A	12-25	1700	4	Chief	4-4¾x6	G,K	3
Post D	12-20	1800	4	Wauk	4-4¼x5¾	GorK	2
Prairie Dog L	9-18	650	3	Wauk	4-3¾x5¼	Gas.	2
Prairie Dog D	15-30	1250	4	Wauk	4-4½x6¼	Gas.	3
Ranger Cul. T-20	8-16	....	4	LeR.	4-3½x4½	Gas.	1
Reed	15-30	2250	4	Dom	4-4¾x6	K.	3-4
Reed A-1	18-36	2400	4	Dom	4-5 x6	Gas.	4
Reliable	10-20	985	4	Own	2-6 x7	Ker.	2
Rex	12-25	1600	4	Wauk	4-4¼x5¾	GorK	3
Russell	12-24	....	4	Own	4-4½x5¾	GorK	2-3
Russell	15-30	....	4	Own	4-5 x6½	GorK	3-4
Russell	20-35	....	4	Own	4-5½x7	GorK	4-5
Russell	30-60	....	4	Own	4-8 x10	GorK	8-10
Samson M	....	995	4	Nov.	4-4 x5½	G,K	2
Sandusky J	10-20	1250	4	Own	4-4¼x5½	G,K,D	2
Sandusky E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
Shawnee Com.	6-12	....	2	LeR.	4-3½x4½	Gas.	10
Shawnee Com.	9-18	....	2	Gray	4-3½x5	....	..
Shelby C	10-20	....	4	Erd.	4-4 x6	GorK	2-3
Shelby D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Short Turn	20-40	1500	3	....	4-4¾x6	G,K	3
Square T A	18-35	2075	3	Clim.	4-5 x6½	K,G	3
Steady Pull	12-24	1485	4	....	4-4 x5	Gas.	3
Stinson 4E	18-36	1835	4	Beav.	4-4¾x6	G,K	4
Stone	20-40	....	4	Beav.	....	G,K	4
Tioga 3	15-27	2625	4	Wisc.	4-4½x6	Gas.	3-4
Titan	10-20	1000	4	Own	2-6½x8	G,K,D	3
Tillermo A	2-6	385	..	Vur.	1-4 x4	G,K	..
Topp B	30-45	3500	4	Wauk	4-4¾x6¾	Gas.	3-4
Toro Cultivator	6-10	....	3	LeR.	4-3½x4½	Gas.	2
Townsend	10-20	....	2	Own	4-6½x7	Ker	2-3
Townsend	15-30	....	2	Own	4-7 x8	Ker	3-4
Townsend	25-50	....	2	Own	4-8½x10	Ker	4-8
Traction Motor	40-50	....	4	....	8-3¼x5	Gas.	4-5
Traylor TB	6-12	815	4	LeR.	4-3½x4½	Gas.	1
Triumph H	18-36	2450	2	Erd.	4-4¾x6	Ker.	4
Trundaar 10	25-40	4250	*2	Wauk	4-5 x6¼	GorK	4
Turner 1921	14-25	1295	4	Buda	4-4¼x5½	G,K	4
Twin City	12-20	....	4	Own	4-4¼x6	G,K	3
Twin City	20-35	....	4	Own	4-5½x6¾	G,K	3
Twin City	40-65	....	4	Own	4-7¾x9	G,K	5
Uncle Sam C20	12-20	1385	4	Wid	4-4 x5½	G or K	8
Uncle Sam B19	20-30	2300	4	Beav.	4-4¾x6	G or K	2-3
Uncle Sam D21	20-30	2075	4	Beav.	4-4¾x6	G or K	3-4
Universal	1-4	475	2	Own	1-3½x5	G	1
Utilitor 501	2½-4	380	4	Own	1-3½x4½	G	1
Velie Biltwell	12-24	1750	4	Own	4-4½x5½	G,K,D	3
Victory 1921	9-18	1350	4	Gray.	4-3½x5	Gas.	2
Victory 1921	15-30	1750	4	Wauk	4-4¼x5¾	Gas.	3
Vim B	15-30	1650	4	Wauk	4-4¾x5¾	G,K	3
Wallis K	15-25	1600	4	Own	4-4¼x5¾	G,K	3
Waterloo N	12-25	....	4	Own	2-6½x7	G,K	3
Webfoot 40	25-40	4000	..	....	....	....	..
Webfoot 53	28-53	5250	*2	Wisc.	4-5¾x7	G,D	..
Wellington B	12-22	1600	4	Erd.	4-4 x6	Ker.	6
Wellington F	16-30	2100	4	Chief	4-4¾x6	Ker.	2-3
Western. 1920	16-32	2100	4	Clim.	4-5x6½	Gas.	3-4
Wetmore	12-25	1650	4	Wauk	4-4 x5¾	G,K	4
Wharton E	12-20	1800	3	Buda	4-4¼x5½	Gas.	3
Whitney	9-18	1175	4	Own	2-5½x6½	Gas.	2
Wichita T	15-30	2300	4	Bear.	4-4½x6	G,K,D	2
Wisconsin E	16-30	....	4	Clim.	4-5 x6½	Ker.	3-4
Wisconsin H	22-40	....	4	Clim.	4-5½x7	Ker.	4
Zelle	12-25	....	4	....	4-4¼x5½	GorK	5 3

ABBREVIATIONS; G—Gasoline, K—Kerosene, D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14-in. plows. LeR—LeRoi. Clim.—Climax. Beav.—Beaver. Dom.—Doman. Cont.—Continental. Nor.—Northway. Wauk.—Waukesha. Wisc.—Wisconsin. T.C.—Twin City. Vur.—Vurac. Evin.—Evinrude. Midw.—Midwest. Weid.—Weideley. Com.—Commercial Tractor. *—Crawler type. All others are wheel type.





Left—As the the conventional type of limousine and, right, converted into an armored car. Note the straps which guards attach to their waists when standing on running board giving them free use of their hands for using rifles.

A Limousine for Perilous Territory

WITHIN a few days His Excellency Toan-Tso Lin, the governor general of Manchuria, will ride through his domains of North China in a fortress limousine, which, embodying all the refinements of present day motor car and body building practice, also has all the characteristics of an armored car. It has recently been forwarded to him from New York by the Packard Motors Export Corp.. Announcement of it was withheld until this week so that there might be no possibility that it would fall into other hands than the Manchurian governor during its long trip to his capitol.

The car embodies all of the features of a finely built limousine and, except for the armament, appears to be the conventional Packard twin six. But otherwise, it differs materially as a result of the China ruler's demand for a car which would protect him from radical and other enemies. An inner lining of chrome steel has been built inside the body and shutters of the same material may be lowered from the roof to cover the side windows. These shutters, in the form of plates linked together so that they may be raised or lowered, completely enclose the inside of the body, operating by a sprocket and chain arrangement built into the top of the car and controlled by metal handles fitting into an overhead crank.

Furthermore, a machine gun of the latest Browning type is mounted on a gun post in the driver's seat, the gun being dismounted and stored in a concealed compartment when there is no necessity for offensive or defensive action. Portholes in the passenger compartment permit the firing of rifles or pistols from that part of the car, there being six of these. The two port holes on each side are closed from the interior with a shutter of armor plate.

Straps for Guards

Furthermore, provision is made for three guards to stand on each side of the running board to protect the passengers from any attack. They are provided with heavy leather belts which may be hooked to special eye bolts, this giving them free use of their hands for handling rifles or revolvers.

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Cincinnati	Fall Automobile Show	Oct. 1-8
New York	Automobile Salon	Nov. 27-Dec. 3
Chicago	Automobile Salon	January—1922

RACES

Indianapolis Speedway	500 Mile Race	May 30
Reno	First Annual Nevada Highway Road Race 1000 miles	June 3-5
Uniontown Speedway	Speedway Events	June 18
Cincinnati	Speedway Race (Possible)	July 4
Tacoma	Speedway Race	July 4
Le Mans	French Grand Prix	July 25
Elgin	Road Race (Possible)	August 3
Pikes Peak	Hill Climb	September 5
Uniontown Speedway	Annual Autumn Classic	September 5
Los Angeles	Speedway Race	November 24

FOREIGN SHOWS

Prague	Czecho-Slovak International Exposition	May 28, 1921
Basle, Switzerland	International Automobile Exhibition	May 28, June 8
Reykjavik, Iceland	Agricultural Machinery	June, 1921
Buenos Aires, Argentina	Passenger Cars and Equipment	September
Luxemburg	Luxemburg Agricultural Sample Exhibition	September
Paris, France	Paris Motor Show	Oct. 5-16
London	British Motor Show, Society Motor Mfrs. and Traders	Nov. 4-12

CONVENTIONS

Buffalo	Convention of Factory Service Managers, Auspices of Service Committee, N. A. C. C.	May 17-19
West Baden, Ind.	Summer Meeting Society of Automotive Engineers	May 24-28
Greenville, S. C.	South Carolina Automotive Trades Association	July 20
Mackinac Island, Mich.	Summer Meeting Automotive Equipment Association	July 4-9
Chicago	Twenty-eighth Annual Convention National Implement & Vehicle Association	Oct. 12-14
Cleveland	National Tire Dealers' Association	November

Business Notes

The Gill Mfg. Co., with the establishment of branches at Spokane and Houston, now has 41 branches prepared to give practically 24 hour piston ring service. The company announces that its complete stock totals 11,000 different sizes and oversizes which is said to provide for the piston ring requirements of every make of internal combustion engine made.

The Manley Mfg. Co., York, Pa., has taken over the inventory, dies, jigs, fixtures and patents of the J. B. S. Mfg. Co., Elmira, N. Y., manufacturer of the Ellis-Smith line of automotive equipment. The Manley company plans to continue the manufacture of the line practically in its entirety in this city.

The United Automotive Body Co., Cleveland, has acquired two new divisions, one at Streator, Ill., to make Ford ambulance and hearse bodies and the other at Evansville, Ind., where crosswise seated bus is made in quantity.

The Biflex Co., Waukegan, Ill., manufacturer of bumpers, is moving into a new, modern plant located near its former factory due to the necessity for increased production.